WORK MEETING AGENDA OF THE CITY COUNCIL OF LAYTON, UTAH

PUBLIC NOTICE is hereby given that the City Council of Layton, Utah, will hold a regular public meeting in the Council Conference Room in the City Center Building, 437 North Wasatch Drive, Layton, Utah, commencing at **5:30 PM on February 18, 2016.**

Item:

1. FEMA Appeal Update

2. Presentation - Transportation Master Plan

3. Presentation - Highway 89 Corridor Planning

4. Amend Layton Municipal Code -Title 3 (Revenue & Finance), Section 3.15.10 (Consolidated Fee Schedule of Layton City Corporation); Title 19 (Zoning), Sections 19.06.010 (Definitions), 19.21.020(8) (General Regulations) and 19.21.045 (Mobile Food Vendor) Establishing Regulations for Mobile Food Vendors - Ordinance 16-06

5. Mayor's Report

In the event of an absence of a full quorum, agenda items will be continued to the next regularly scheduled meeting.

This meeting may involve the use of electronic communications for some of the members of the public body. The anchor location for the meeting shall be the Layton City Council Chambers, 437 North Wasatch Drive, Layton City. Members at remote locations may be connected to the meeting telephonically.

Notice is hereby given that by motion of the Layton City Council, pursuant to Title 52, Chapter 4 of the Utah Code, the City Council may vote to hold a closed meeting for any of the purposes identified in that Chapter.

Date: ____ By: ____

Thieda Wellman, City Recorder

LAYTON CITY does not discriminate on the basis of race, color, national origin, sex, religion, age or disability in the employment or the provision of services. If you are planning to attend this public meeting and, due to a disability, need assistance in understanding or participating in the meeting, please notify Layton City eight or more hours in advance of the meeting. Please contact Kiley Day at 437 North Wasatch Drive, Layton, Utah 84041, 801.336.3825 or 801.336.3820.

LAYTON CITY COUNCIL MEETING
AGENDA ITEM COVER SHEET

Item Number: 1.

Subject:
FEMA Appeal Update

Background:
Jamie Huff, Risk MAP Program Manager for the State of Utah, and Tom Wright, Project Manager, Senior Engineer for AECOM (State's project contractor), have been asked to give the Mayor and Council an update on the FEMA appeal.

Alternatives:
N/A

Recommendation:
N/A

LAYTON CITY COUNCIL MEETING
AGENDA ITEM COVER SHEET

Item Number: 2.

Subject:
Presentation - Transportation Master Plan

Background:
Mr. Steven Lord, Project Manager for Horrocks Engineering, will make a presentation to the Mayor and Council on the Master Transportation Plan.

Alternatives:
N/A

Recommendation:
N/A

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LAYTON CITY TRANSPORTATION MASTER PLAN

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Glossary of Terms

AADT	Annual Average Daily Traffic
AASHTO	American Association of State Highway and Transportation Officials
ADA	Americans with Disabilities Act
BRT	Bus Rapid Transit
CFP	Capital Facilities Plan
FHWA	Federal Highway Administration
GOPB	Governor's Office of Planning and Budget
HCM	Highway Capacity Manual
HOA	Homeowner's Association
IFFP	Impact Fee Facilities Plan
ITE	Institute of Transportation Engineers
LOS	Level of Service
LRTP	Long Range Transportation Plan
MPO	Metropolitan Planning Organization
MUTCD	Manual on Uniform Traffic Control Devices
STIP	Statewide Transportation Improvement Program
STP	Surface Transportation Program
TAZ	Traffic Analysis Zone
TCM	Traffic Calming Measures
TIP	Transportation Improvement Program
TIS	Traffic Impact Study
TMP	Transportation Master Plan
TRAX	Transit Express (light rail)
TRB	Transportation Research Board
UDOT	Utah Department of Transportation
UTA	Utah Transit Authority
WFRC	Wasatch Front Regional Council

Executive Summary

Layton City has experienced significant growth and development in recent years with growth of approximately 30,700 residents since 1990. With Layton City committed to continued growth, it is projected that the population in 2040 will be above 80,000. A Transportation Master Plan (TMP) has been implemented so the transportation system can accommodate the projected growth in the City for the year 2040.

As part of the plan, the current roadway network was assessed using current traffic volumes. Current traffic volumes were projected through the year 2040 using the current roadway network to find the capacity improvements necessary for the roadway network to positively contribute to the economic and community development in Layton City. The following sections are included in the Layton City TMP.

Roadway Network Analysis

A major contribution to a successful transportation system is to have a connected street system. A connected system improves the reduction of traffic congestion, commute times, emergency response times, etc. Roadways share two functions: mobility and land access. These two functions share an inverse relationship, meaning a roadway with high mobility has minimal land access points and a roadway with low mobility has frequent land access points. Roadway classifications are implemented in a connected roadway network to designate the amount of mobility and land access the roadway will have. The following roadway classification is used in Layton City: Freeway, Principal Arterial, Major Arterial, Arterial, Collector, Minor Collector, and Local Street. These classifications range from most mobile and least access points (Freeway) to least mobile with frequent access points (Local Street), creating a hierarchy in the roadway system. Intersections are used in the roadway system to allow for the progression from high mobility to low mobility and frequent land access points. Freeways connect with Arterial Streets, which connect with Collector Streets, which connect with Local Streets. Correct use of all roadway functional classifications within the city allows for a successful, connected roadway system.

To measure the performance of a roadway segment, Level of Service (LOS) is used. LOS is defined by the Federal Highway Administration (FHWA) to determine the level of congestion on a roadway segment or intersection. To measure LOS, a letter grade is assigned a letter grade A through F where A represents free flowing traffic and F represents grid lock. LOS is measured using daily traffic volumes and delay per vehicle for roadway segments and intersections respectively. The LOS of a roadway segment or intersection is used to determine if capacity improvements are necessary. In Layton City, a standard of LOS D or better was adopted as an acceptable LOS.

As part of the TMP, data was collected for the existing roadway network and a LOS was determined for each roadway segment and intersection. The existing traffic volumes were projected to 2040 using the

Wasatch Front Regional Council (WFRC) travel demand model. The WFRC is a collaboration of local government and community members from Salt Lake, Weber, Tooele, Morgan and Box Elder counties in Utah to plan future growth. This model includes the West Davis Corridor. Other adjustments to the WFRC travel demand model were made based on socioeconomic data and Layton City's land use plan. Projected 2040 traffic was first modeled for the no-build scenario. Typically, the no-build scenario acts as a guide for roadway capacity inefficiencies that will need to be improved by 2040. Using the no-build scenario as a base for roadway capacity improvements, the projected 2040 traffic was modeled using the West Davis Corridor WFRC model. The segments with LOS E or worse with the 2040 projected traffic volumes will be recommended to undergo capacity improvements to achieve acceptable LOS.

Capital Facilities Plan

A Capital Facilities Plan outlines all improvements necessary to provide Layton City with an adequate roadway system in 2040 based on the projected 2040 traffic volumes. This plan is updated by the City as project scopes change and development occurs. As part of the TMP, a Transportation Improvement Plan (TIP) is included that outlines all the projects necessary to accommodate future traffic volumes. It is expected that the total cost of necessary roadway improvements for Layton City is approximately **$45,427,000**.

Alternative Modes of Transportation

Included in this TMP are discussions about alternative modes of transportation. Currently, the transit service in Layton City is operated by the Utah Transit Authority (UTA). UTA offers services such as commuter rail, light rail, bus, bus rapid transit (BRT), ski buses, and van share. Currently, transit service in Layton City includes the FrontRunner and bus services. The WFRC long range model calls for enhanced bus service, the introduction of BRT on Main Street as well as improving Frontrunner service.

Various Layton City policies were reviewed to determine their effect on bicycling and walking. A "best practices" review was then conducted in the area of bicycle and pedestrian-related policies to develop appropriate recommendations that the City can modify and/or adopt. Basic descriptions of the recommended changes and additions are given in this TMP along with information about where the City may find more detailed resources (if applicable) about the recommended policies.

Transportation Plan Guidelines

This section is a discussion of the other elements included in the TMP. There is a discussion describing using a Traffic Impact Study (TIS) prior to development. A TIS assesses the impacts to the roadway system due to new development, which helps the City prepare for the impacts to the roadway network caused by the development. Another discussion included in the TMP is Intelligent Transportation Systems (ITS). ITS refers to the increased use of technology and communication methods to improve traffic operations. Specifically, the use of ITS to improve traffic signal performance. The other elements discussed in this section are Access Management, Travel Demand Management, School Zone Planning, Connectivity, Americans with Disabilities Act (ADA), Traffic Calming, Safety and Corridor Preservation.

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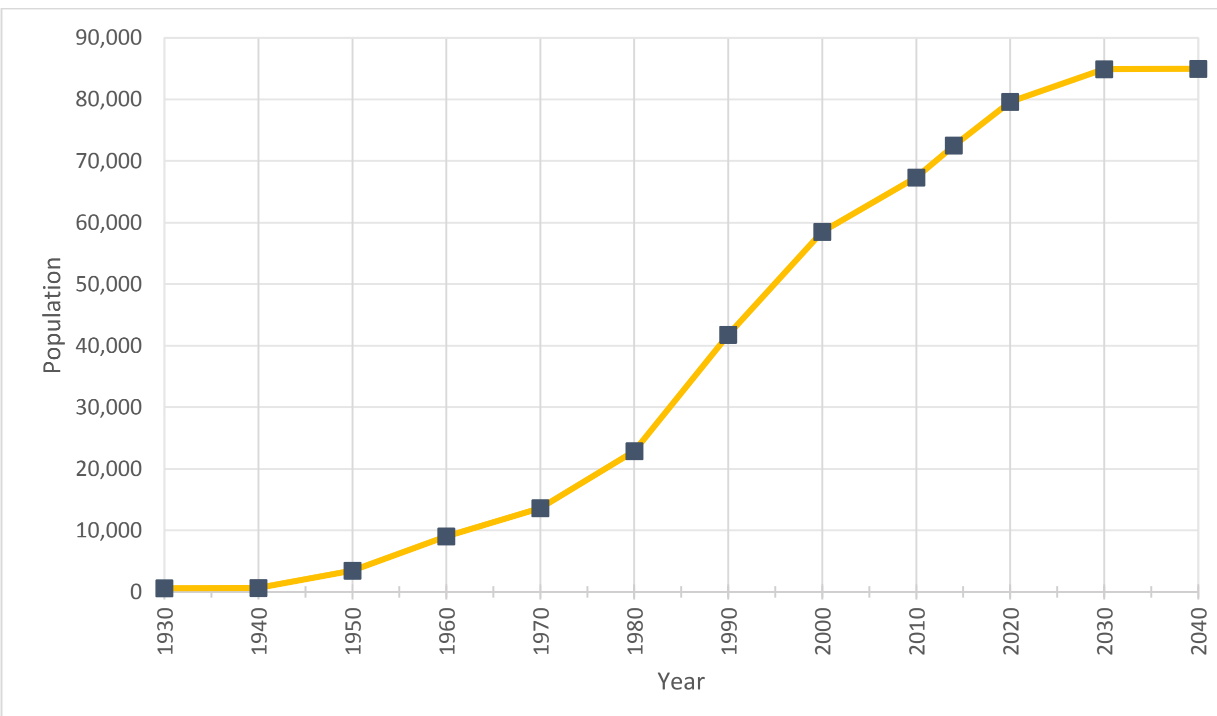
Introduction

Layton City has seen rapid growth in recent years. Located in the northeastern portion of the Davis County, Layton City is bordered to the north by Clearfield, South Weber and Hill Air Force Base; to the south by Kaysville; to the east by the Wasatch Mountain Range and on the west by Syracuse City. Within the city there is a mix of residential, commercial, and industrial development as well undeveloped land, particularly in the western portion of the city. A map of Layton City and the surrounding area is shown in **Figure 2**.

Layton City and the surrounding communities have recently experienced significant growth and development, which is expected to continue in the future, as shown in the **Figure 1**. Layton City's population growth from 2000 to 2010 was 8,837 (15.1%). The current population (2014) is slightly above 72,000 according to the U.S. Census Bureau. By the year 2020 the population is projected to be around 80,000 and up to 85,000 by the year 2040. To keep pace with projected growth, a comprehensive transportation plan must be developed and regularly maintained. This plan must incorporate the goals of Layton City regarding the transportation systems within their jurisdiction as well as those regional facilities maintained by UDOT, UTA, Davis County, and neighboring communities.

Figure 1: Layton City Population



This Transportation Master Plan (TMP) contains an analysis of the existing transportation network and conditions. Any major deficiencies are itemized and possible improvement or mitigation alternatives are discussed. An analysis of the future transportation network is also included for the horizon year 2040. Any major UDOT projects and improvements within the city, such as the West Davis Corridor, are reflected in the future network. Any deficiencies in the future transportation network that are expected to exist and would not be accommodated by projects that are currently planned will be discussed. A list of recommended improvements and projects will then be given to aid Layton City in planning for future transportation projects as well as in working with other agencies such as UDOT or neighboring cities. This Transportation Master Plan is intended to be a useful tool to aid Layton City in taking a proactive effort in planning and maintaining the overall transportation network within their city.

History

The City of Layton was established in 1850 as an agricultural extension to the settlement that was later incorporated as Kaysville, Utah. The original boundaries of what was called Kays Ward extended from Haight's Creek on the south to the Weber County line and the Weber River in the north, and from the Wasatch Mountains on the east to the shores of the Great Salt Lake on the west. Although the settlers of Kays Ward eventually laid out streets and established a typical town plan and city center in 1854, the area that is now Layton remained rural, unorganized and unplanned during this early period.

Because Layton was an outgrowth of Kaysville, the settlers did not build their homes around a city block plan or a central fort. When fort districts were established in 1854 and 1855, for protection, the people living along Kays Creek contributed money and labor to the building of the Kays Ward fort. However, these settlers never lived in the Kays Ward fort area but built their own stockade called "Little Fort". This structure was built on the east side of Kays Creek, south of what is now known as Fort Lane Street.

Following the building of a wagon road between Salt Lake City and Ogden, several mercantile and trade establishments were founded along what is now known as Layton's Main Street. Also, in the late 1860's the Utah Central Railway was built with tracks running parallel to Main Street. As a result, several businessmen opened workshops (blacksmiths, shoemakers, tanners, harness makers, weavers) or became tradesmen (carpenters, rock masons, sawyers). Other settlers built flourmills, made adobe bricks, or became innkeepers. With time, the small business district came to be known as Kays Creek, a suburb of Kaysville three miles to the south.

In 1907, the people living in Layton officially separated from Kaysville and a new town was born. Throughout the 1900's, there have been major developments which have changed the transportation infrastructure, such as the addition of Hill Air Force Base in 1940, I-15 in the 1960's, and Layton Hills Mall in 1980. The transportation infrastructure will continue to adapt to meet the needs as Layton City continues to develop.

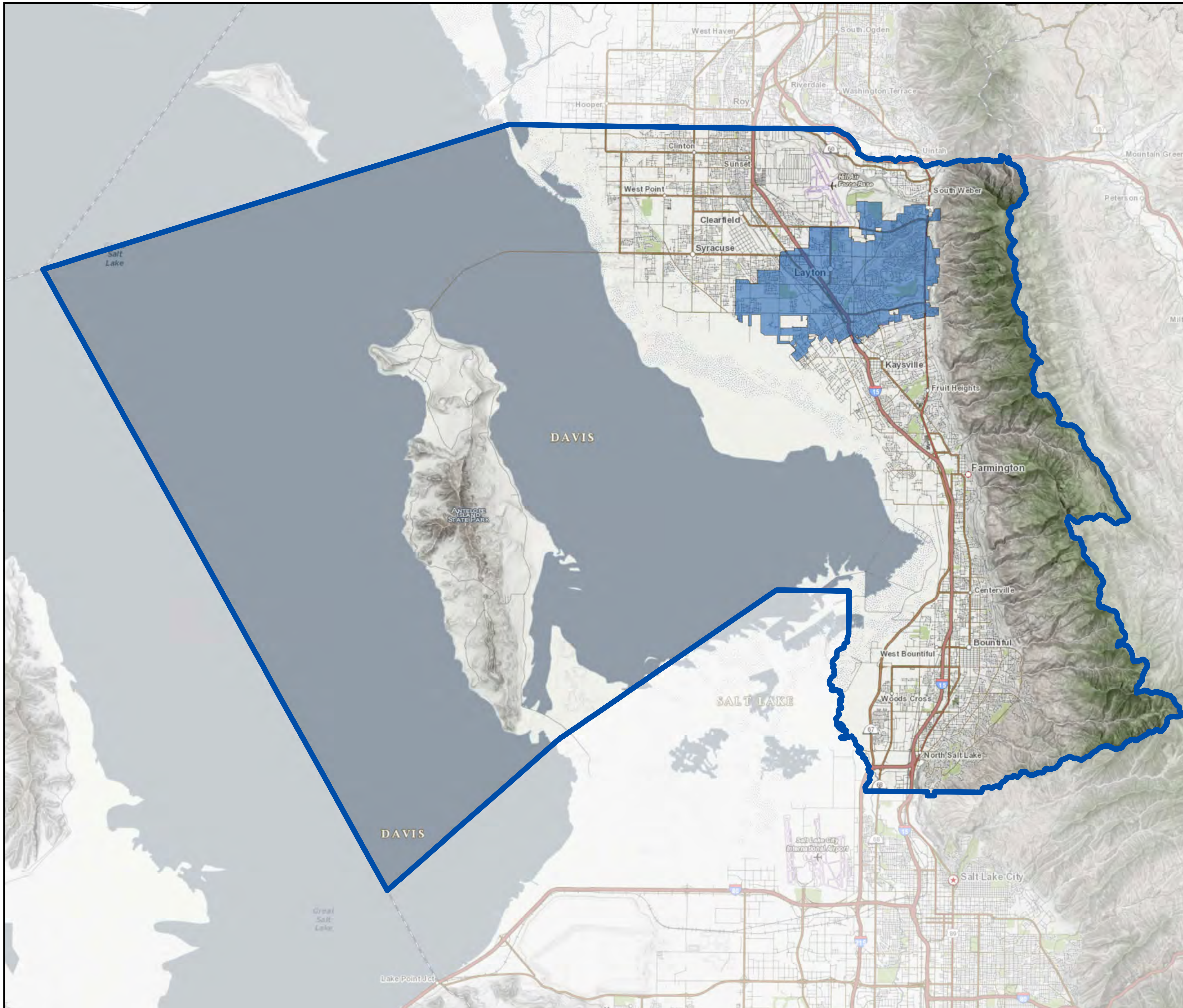


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Figure 02: Layton City Area Map

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Roadway Network Analysis

Transportation planning in the region is a cooperative effort of state and local agencies. The WFRC is responsible for coordinating this transportation planning process in the Ogden/Layton and Salt Lake urbanized areas as the designated Metropolitan Planning Organization (MPO). Metropolitan Planning Organizations are agencies responsible for transportation planning in urbanized areas throughout the United States. The Governor designated the Wasatch Front Regional Council (WFRC or Regional Council) as the Metropolitan Planning Organization for the Salt Lake and Ogden Areas in 1973. This section includes a general discussion on the travel demand modeling process used for this TMP, functional classification of streets, and level of service of streets and intersections. Also included are the existing and future conditions for 2025 and 2040.

Traffic Demand Modelling

Traffic Demand Modelling was used to project existing traffic conditions into the future. Layton City's land use plan, socioeconomic data as well as additional data obtained from the City and the Wasatch Front Regional Council (WFRC) serve as valuable input into the travel demand model. The WFRC has a regional travel demand model which was used for this TMP. This section discusses the socioeconomic data, land use, vehicle trip generation as well as the precautions of using the WFRC Travel Demand Model.

Land Use Planning

The majority of the socioeconomic data used in this study is based on the best available statewide data provided by the Governor's Office of Planning and Budget (GOPB). This data was supplemented and verified using the data provided by the City in the form of the current adopted general plan as of October 28, 2013 as shown in **Figure 3** (the most recent version can be found on Layton City's website at www.laytoncity.org).

The information is considered to be the best available data for predicting future travel demands. However, land use planning is a dynamic process and the assumptions made in this report should be used as a guide and should not supersede other planning efforts especially when it comes to localized intersections and roadways.

Socioeconomic Conditions

Currently, Layton City's population is estimated to be 72,500 residents which includes 22,356 dwelling units. The median household income in the city is $65,439 and the average family size is 3.59. The median age of Layton City residents is 29.2 years. The 2000 to 2010 decade saw moderate growth in Layton, with an increase in population from 58,474 to 67,311 (15.1 percent). The City has an unemployment rate of 3.10. There are 2,735 licensed businesses in the City and the average travel time to work for the workforce is 24 minutes.

Based on the current land use, zoning, demographics, and growth patterns, Layton City is expected to grow to approximately 85,000 residents by the year 2040. The forecasted growth within Layton City as well the surrounding cities will place increased pressure on the City's infrastructure, including the street network. Layton City is also committed to increasing commercial, office, and retail stores to provide greater opportunity for residents to live, work, and play in the City. This growth will therefore have considerable impact on traffic volumes in the City.

Trip Generation

In order to generate vehicle trips, sections of the city are split into geographical sections called Traffic Analysis Zones (TAZ). Each TAZ contains socioeconomic data including the number of households, employment opportunities, and average income levels. This data is used to generate vehicle trips that originate in the TAZ. All trips generated in the TAZ are assigned to other TAZs based on the data within other zones. Since the WFRC travel demand model predicts regional travel patterns, the TAZ structure was updated to obtain more detailed travel demand data for Layton City. This was completed by splitting larger TAZ's. The new TAZ structure used for this analysis is shown in **Figure 4**.

Travel Demand Model Precautions

Layton City aims to plan for and encourage responsible and sustainable growth in the City. Part of the commitment to provide a sustainable system includes encouraging a reduction in vehicle trips by providing a balance of roads, trails and bikeways, and public transit facilities. Today's transportation system should not only accommodate existing travel demands, but should also have built-in capacity to account for the demand that will be placed on the system in the future. While considering the socioeconomic data used in this report and the anticipated growth in the City, some precautions should be considered. First, the TAZ specific socioeconomic data only approximates the boundary conditions of the City and is based on data provided by WFRC and the City's planning documents. Second, actual values may vary somewhat as a result of the large study area of the regional travel demand model, which includes the unincorporated areas around Layton City. Therefore, the recommendations in this report represent a planning level analysis and should not be used for construction of any project without review and further analysis. This document should also be considered a living document and should be updated regularly as development plans, zoning plans, and traffic patterns and trends change.

Layton City General Plan

Legend

General Plan

- Agricultural Holding Zone
- Business\Research Park
- Commercial
- Downtown Mixed Use
- High Density Over 16 Unit
- Hill AFB Easement Area
- Low Density 0-3 Units
- Low Density 2-4 Units
- Low Density 3-6 Units
- MU
- Manufacturing
- Medium Density 6-12 Units/ Acre
- Medium Density 8-16 Units/ Acre
- Mixed Use
- Open Space\Public Fac
- Professional Business
- Layton City Boundary
- Highway/Freeway
- Property
- APZ
- Hill Airforce Base Runway
- Proposed Annexaiton Areas
- Lakes
- Streams
- Rail Lines
- Interstate 15
- West Davis Corridor
- Business Node
- Commercial Node

Date: 10/28/2013

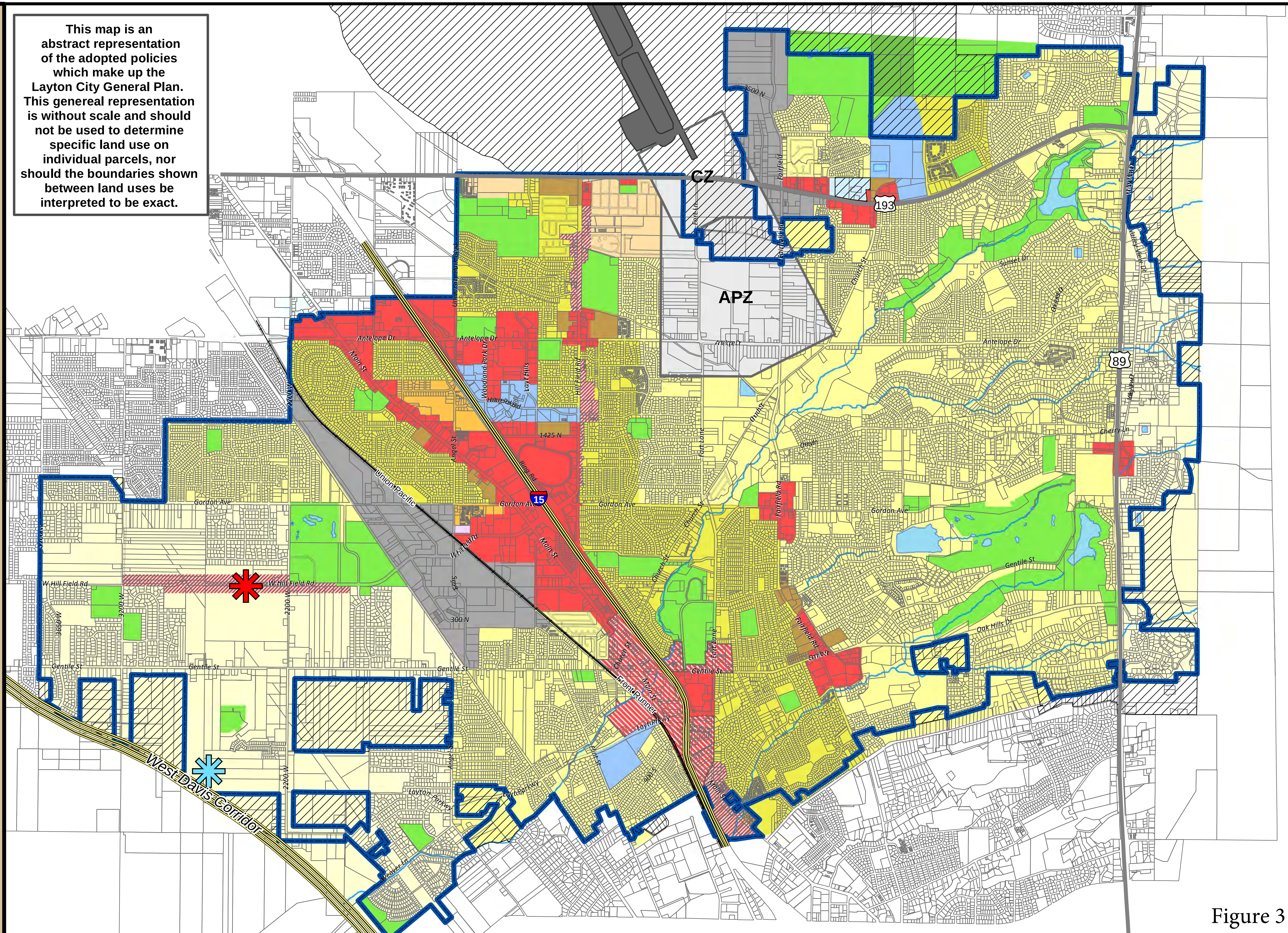

Figure 3

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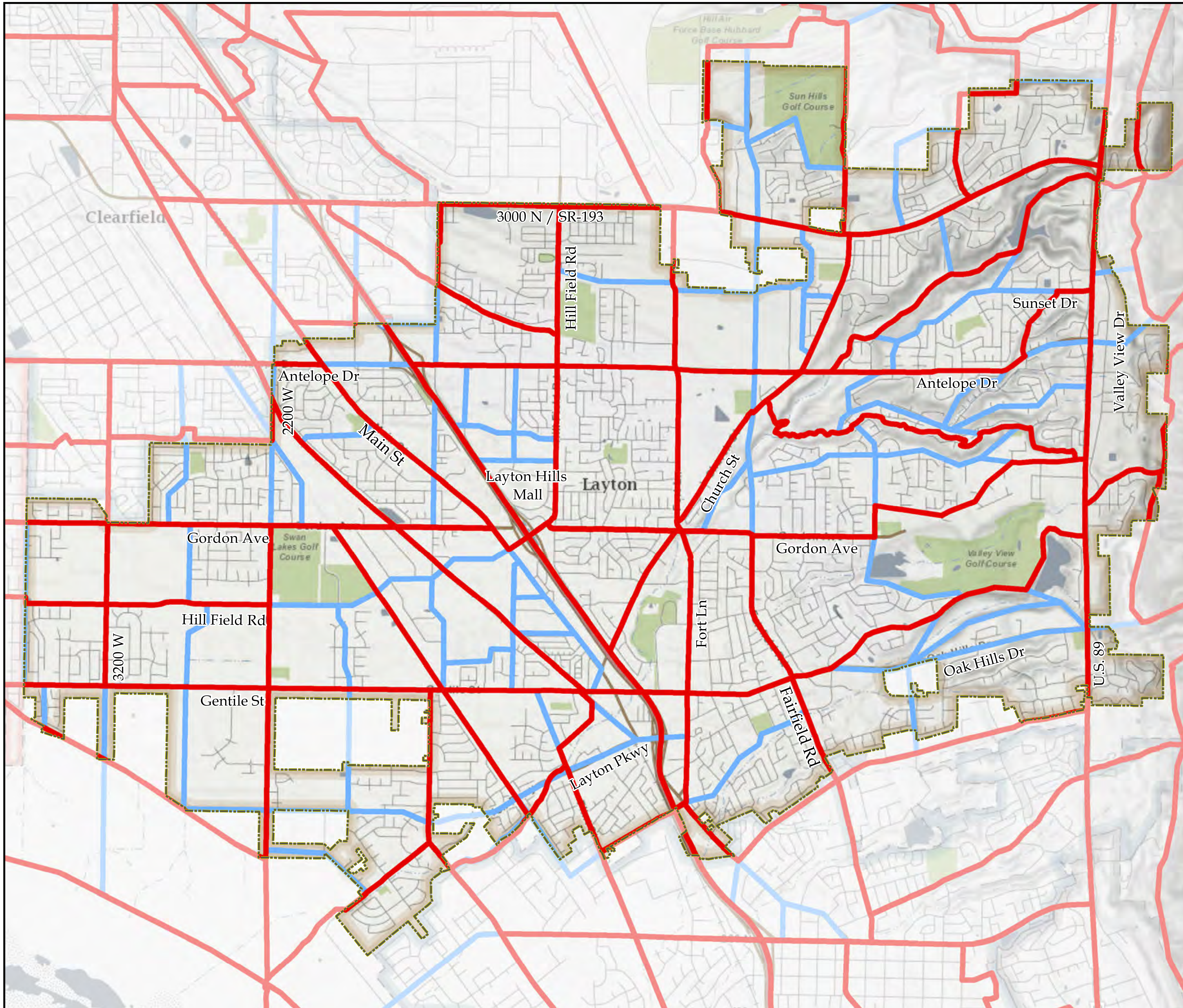
Figure 04: Traffic Analysis Zones



Legend

- WFRC Traffic Analysis Zones
- New Traffic Analysis Zone
- Layton City Boundary

N

0 0.5 1 2 Miles

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Functional Classification

All trips include two distinct functions: mobility and land access. Mobility and land access share an inverse relationship, meaning as mobility increases land access decreases. Street facilities are classified by the relative amounts of through and land-access service they provide. There are four primary classifications: Freeway/Expressway, Arterial, Collector and Local Streets. Each classification is explained in further detail in the following paragraphs and is also represented in **Figure 5**.

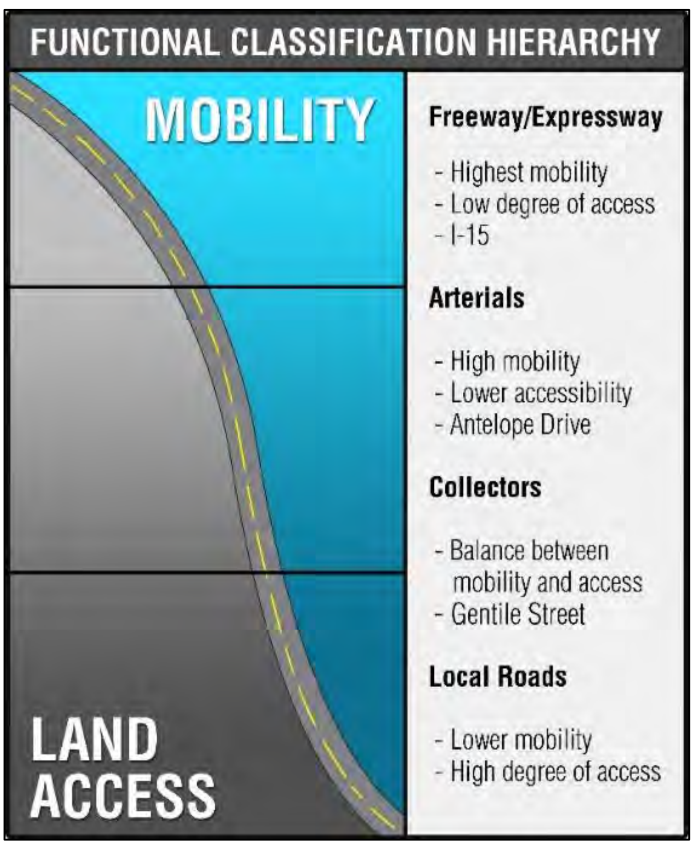
Freeways and Expressways – *Freeway and expressway facilities provide service for long distance trips between cities and states. No land access is provided by these facilities.*

Arterials – *Arterial facilities provide service primarily through-traffic movements. All traffic controls and the facility design are intended to provide efficient through movement. There are limited access points to these facilities.*

Collectors – *Collector facilities are intended to serve both through and land-access functions in relatively equal proportions. They are frequently used for shorter through movements associated with the distribution and collection portion of trips*.

Local Streets – *Local street facilities primarily serve land-access functions. The design and control facilitates the movement of vehicles onto and off of the street system from land parcels.*

Figure 5: Mobility vs. Access Chart



Each of the major classifications described above can be further subdivided. Currently in Layton City, arterials and collectors are divided into major and minor classifications. For each classification, major movements have higher carrying capacity and provide more through movements than the minor movements. For this TMP, the major and minor designations are determined based on the number of lanes on the roadway facility. **Table 1** shows the number of lanes and the right of way for each functional class. This designation helps in identifying the appropriate cross-section as well as the carrying capacity of the roadway.

Table 1: Typical Cross-Sections

Functional Classification	Number of Lanes	Right of Way Width (ft.)
Minor Street/Residential	2	50/58
Minor Collector	2	60
Collector	3	66
Minor Arterial	3	84
Arterial	5	100
Principal Arterial	7	124

For this TMP, each functional classification is color coded based on the number of lanes on each street. Many of the city streets were constructed prior to the adoption of the typical street sections and therefore do not comply with these standards. As such, designating the streets as arterials and collectors in the existing conditions analysis may be misleading.

Private streets are rare in the City and should be used where public streets are not possible. However, if private streets are allowed they should meet the minimum cross-section design shown in this chapter. A more detailed description of the characteristics of the four primary functional classifications of streets are found in **Table 2**.

All information on design and development in Layton City can be found in the Standard Drawings for the *Layton City Development Guidelines and Design Standards* adopted in April, 2015. The most current version can be found online at http://www.laytoncity.org.

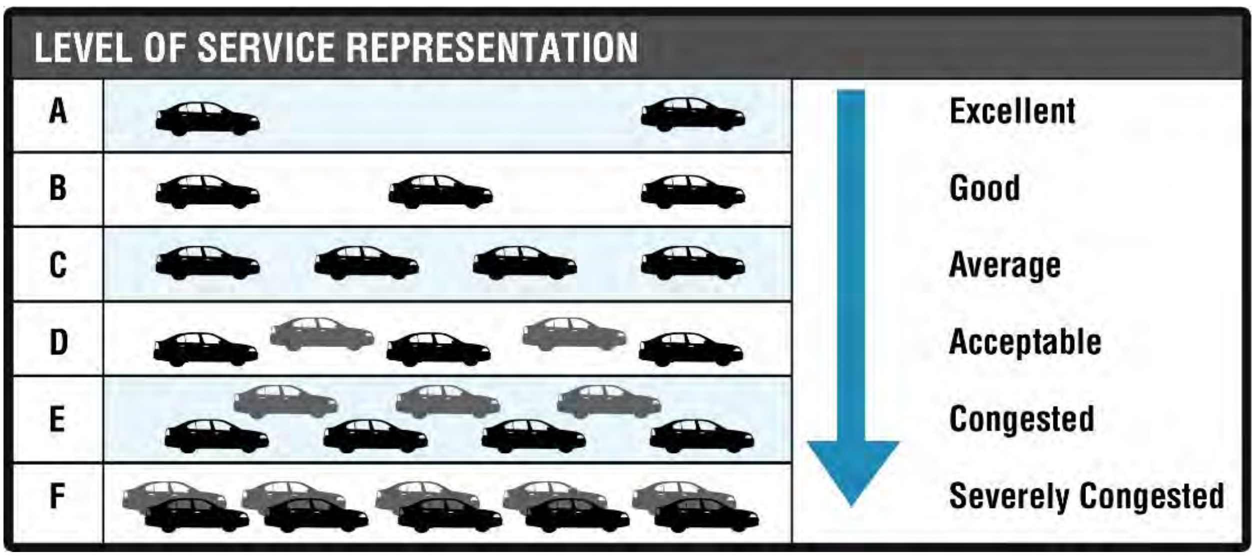
Table 2 Street Functional Classification

Characteristic	Functional Classification			
	Freeway and Expressway	Arterial	Collector	Local Street
Function	Traffic movement	Traffic movement, land access	Collect and distribute traffic between streets and arterials, land access	Land access
Typical % of Surface Street System Mileage	Not applicable	5-10%	10-20%	60-80 %
Continuity	Continuous	Continuous	Continuous	None
Spacing	4 miles	1-2 miles	½-1 mile	As needed
Typical % of Surface Street System Vehicle-Miles Carried	Not applicable	40-65%	10-20%	10-25 %
Direct Land Access	None	Limited: major generators only	Restricted: some movements prohibited; number and spacing of driveways controlled	Safety controls access
Minimum Roadway Intersection Spacing	1 mile	½ mile	300 feet-¼ mile	300 feet
Speed Limit	55-75 mph	40-50 mph in fully developed areas	30-40 mph	25 mph
Parking	Prohibited	Discouraged	Limited	Permitted
Comments	Supplements capacity of arterial street system & provides high-speed mobility	Backbone of street system		Through traffic should be discouraged; Subject to traffic calming

Level of Service

The adequacy of an existing street system can be quantified by assigning Levels of Service (LOS) to major roadways and intersections. As defined in the *Highway Capacity Manual (HCM),* a document published by the Transportation Research Board (TRB), LOS serves as the traditional form of measurement of a roadway's functionality. The TRB identifies LOS by reviewing elements, such as the number of lanes assigned to a roadway, the amount of traffic using the roadway and the time of delay per vehicle traveling on the roadway and at intersections. Levels of service range from A (free flow where users are virtually unimpeded by other traffic on the roadway) to F (traffic exceeds the operating capacity of the roadway) as shown in **Figure 6**.

Figure 6: Level of Service Representation



Roadway Level of Service

Roadway LOS is used as a planning tool to quantitatively represent the ability of a particular roadway to accommodate the travel demand. The following tables: **Table 3**, **Table 4**, and **Table 5** show LOS traffic volume thresholds for each of the major roadways in the City. These values are based on HCM principles and regional experience. Roadway segment LOS can be mitigated with geometry improvements, additional lanes, two-way-left turn lanes, and access management.

Table 3 Suburban Freeway LOS Capacity Criteria in Vehicles per Day

Lanes	LOS C	LOS D	LOS E
4	60,000	70,000	89,000
6	95,000	110,000	140,000

Table 4 Suburban Arterial LOS Capacity Criteria in Vehicles per Day

Lanes	LOS C	LOS D	LOS E
3	11,500	13,000	16,500
5	26,500	30,500	39,000
7	40,000	46,000	59,000

Table 5 Suburban Collector LOS Capacity Criteria in Vehicles per Day

Lanes	LOS C	LOS D	LOS E
2	9,000	10,500	13,500
3	10,000	11,500	15,000
5	21,500	25,000	31,500

LOS D is approximately 80 percent of a roadway's capacity and is a common goal for urban streets during peak hours. A standard of LOS D for system streets (collectors and arterials) is acceptable for future planning. Attaining LOS C or better on these streets would be potentially cost prohibitive and may present societal impacts, such as the need for additional lanes and wider street cross-sections. LOS D suggests that for most times of the day, the roadways will be operating well below capacity. The peak times of the day will likely experience moderate congestion characterized by a higher vehicle density and slower than free flow speeds.

Intersection Level of Service

Whereas roadway LOS considers an overall picture of a roadway to estimate operating conditions, intersection LOS looks at each individual movement at an intersection and provides a much more precise method for quantifying operations. Since intersections are typically a source of bottlenecks in the transportation network, a detailed look into vehicle delay at each intersection should be performed on a regular basis. The methodology for calculating delay at an intersection is outlined in the *H*ighway Capacity Manual (HCM) and the resulting criteria for assigning LOS to signalized and un-signalized intersections are outlined in **Table 6**. LOS D is considered the industry standard for intersections in an urbanized area. LOS D at an intersection corresponds to an average control delay of 35-55 seconds per vehicle for a signalized intersection and 25-35 seconds per vehicle for an un-signalized intersection.

At a signalized intersection under LOS D conditions, the average vehicle will be stopped for less than 55 seconds. This is considered an acceptable amount of delay during the times of the day when roadways are most congested. As a general rule, traffic signal cycle lengths (the length of time it takes for a traffic signal to cycle through each movement in turn) should be below 90 seconds. An average delay of less than 55 seconds suggests that in most cases, no vehicles will have to wait more than one cycle before proceeding through an intersection.

Un-signalized intersections are generally stop-controlled. These intersections allow major streets to flow freely, and minor intersecting streets to stop prior to entering the intersection. In cases where traffic volumes are more evenly distributed or where sight distances may be limited, four-way stop-controlled intersections are common. LOS for an un-signalized intersection is assigned based on the average control of the worst approach (always a stop approach) at the intersection. An un-signalized intersection operating at LOS D means the average vehicle waiting at one of the stop-controlled approaches will wait no longer than 35 seconds before proceeding through the intersection. This delay may be caused by large volumes of traffic on the major street resulting in fewer gaps in traffic for a vehicle to turn, or for queued vehicles waiting at the stop sign. Roundabout LOS is also measured using the stopped controlled LOS parameters.

Table 6: Intersection Level of Service

LOS*	Signalized Intersection (sec)	Stop-Controlled/ Roundabout (sec)
A	≤10	≤10
B	>10-20	>10-15
C	>20-35	>15-25
D	>35-55	>25-35
E	>55-80	>35-50
F	≥80	≥50

*LOS F when traffic volumes exceed capacity

Intersection and roadway segment LOS problems must be solved independently of each other, as the treatment required to mitigate the congestion is different in each case. Intersection problems may be mitigated by adding turn lanes, improving signal timing, and improving corridor signal coordination.

Existing Roadway Network Conditions

Travel Demand Model Calibration

As with the TAZ structure, the WFRC Travel Demand Model was calibrated to fit existing traffic conditions in Layton City. The method used to calibrate the model was to use traffic counts throughout the City. Traffic counts were collected from UDOT and include annual average daily traffic (AADT) volumes as defined in *Traffic on Utah Highways.* On City owned roadways, traffic counts were either provided by Layton City or were manually counted as part of this TMP. **Figure 7** shows the count locations throughout the City used for model calibration.

Existing Functional Classification and Level of Service

The existing functional classification used in the WFRC Travel Demand Model is shown in **Figure 8**. The LOS was calculated for each roadway and intersection according to the guidelines explained in the Level of Service section and a LOS map is included in **Figure 9**. Avenue Consultants was hired to complete the intersection Level of Service analysis. The intersection LOS is not represented on the map, but the results of their analysis are found in **Appendix A: Intersection Analysis**.

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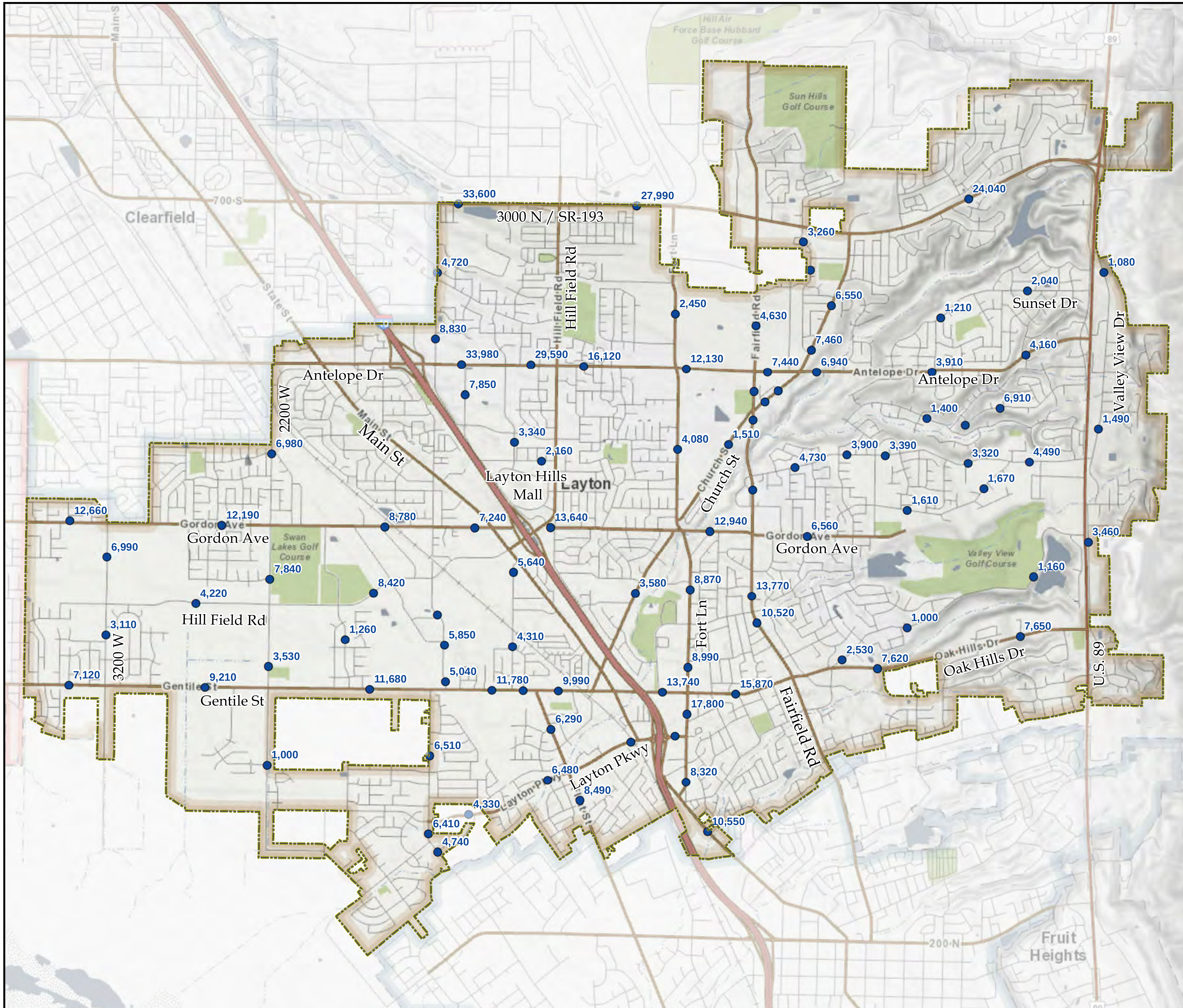
Figure 07: Existing Daily Traffic Volumes



Legend

- Daily Traffic Count
- Layton City Boundary

0 0.5 1 2 Miles

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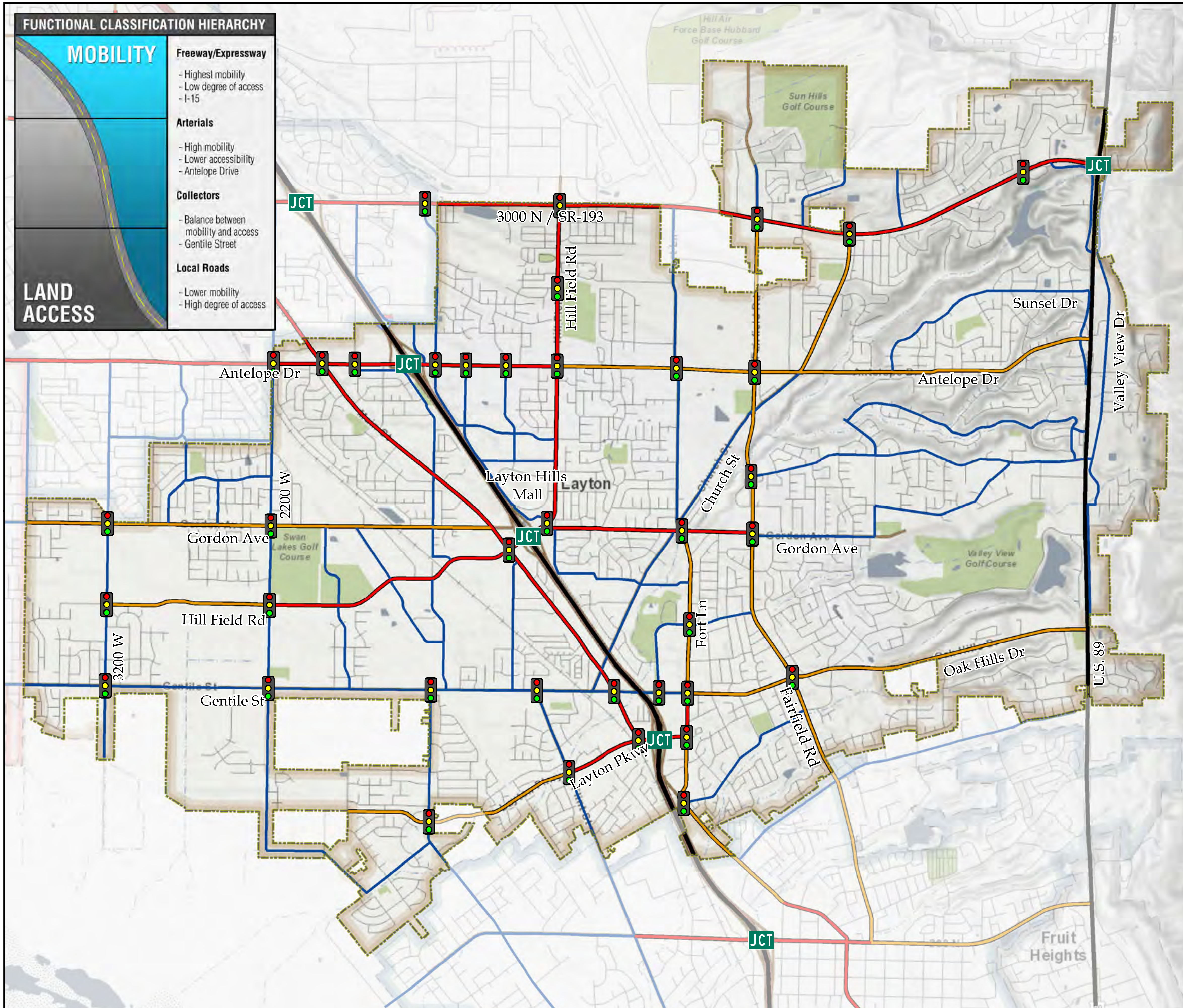
Figure 08: Existing Roadway Network



Legend

Existing Roadway Network

- Freeway/Expressway
- Major Arterial 4/5 Lanes
- Minor Arterial 2/3 Lanes
- Collector 2/3 Lanes
- JCT Existing Interchange
- Existing Traffic Signal
- Layton City Boundary

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0 0.5 1 2 Miles

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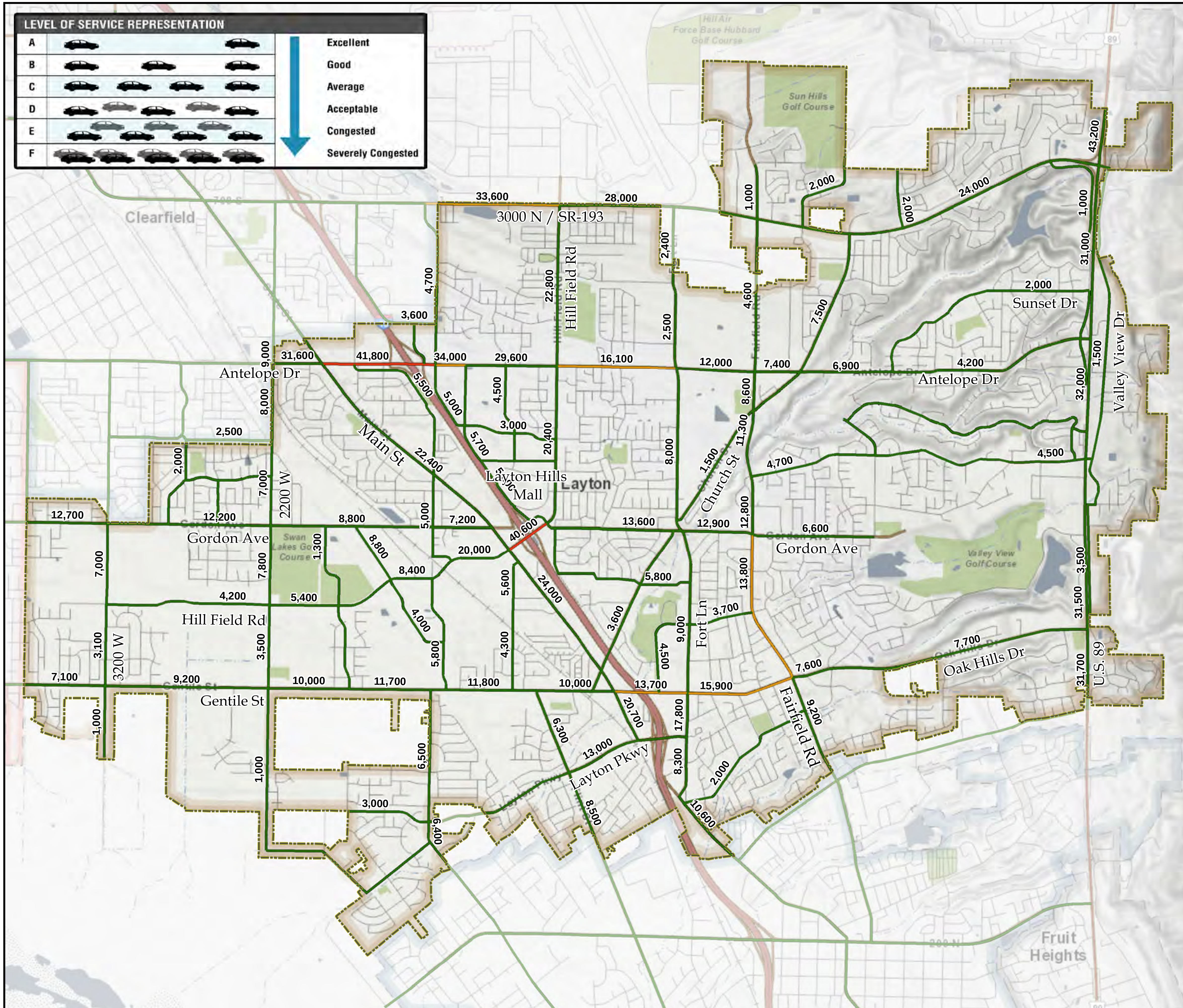
Figure 09: Existing Level of Service



Legend

- Acceptable (LOS D or Better)
- Unacceptable (LOS E)
- Unacceptable (LOS F)
- Layton City Boundary

N

0 0.5 1 2 Miles

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Mitigations to Existing Capacity Deficiencies

Using LOS D as the threshold for roadway improvements in **Figure 9** (Indicated by red lines), the following shows the roadways and intersections (from **Appendix A: Intersection Analysis**) that have existing capacity deficiencies:

Roadway Segments at or below LOS E:

- **Antelope Drive**: Hill Field Road to Fort Lane and University Park Blvd. to 1000 West
- **3000 North (SR 193):** University Park Blvd to Hill Field Road
- **Fairfield Road:** Gordon Avenue to Gentile Street
- **Gentile Street:** Main Street to Fairfield Road
- **Antelope Drive:** University Park Blvd. to Main Street
- **Hill Field Road:** Junction with I-15

Intersections at or below LOS E

- **Weaver Lane and Angel Street**

In most cases, roadway capacity improvements are achieved by adding travel lanes. In some cases additional capacity can be gained by striping additional lanes where the existing pavement width will accommodate it. This can be accomplished by eliminating on street parking, creating narrower travel lanes, and adding two-way left turn lanes where they don't currently exist. For all roadway capacity improvements, it is recommended to investigate other mitigation methods before widening the roadway.

At signalized intersections, methods to improve intersection LOS include additional left and right turning lanes and signal timing improvements. The only intersection below LOS D is at Weaver Lane and Angel Street. The solution for this intersection would be to install a traffic signal with an exclusive northbound left turn lane.

Future Roadway Network Conditions

By calibrating the WFRC Travel Demand Model to fit the existing traffic conditions in Layton City, the model is prepared to project traffic volumes into the future. There are two future models used for this TMP. The first model used was to identify potential capacity deficiencies, called the 2040 No Build Model. The other model used was the 2040 Master Plan Solution Model, which includes all future projects to improve the deficiencies in the 2040 No Build Model.

No Build Level of Service

A no-build scenario is intended to show what the roadway network would be like in the future if no action is taken to improve the City roadway network. The travel demand model was again used to predict this condition by applying the future growth and travel demand to the existing roadway network. As shown in **Figure 10**, the following roadways would perform at LOS E or worse if no action were taken to improve the roadway network:

- **Antelope Drive** (Fairfield Road to Western Border)
- **3000 North** (Fairfield Road to Western Border)
- **Gentile Street** (2200 West to 3200 West; Flint Street to Sugar Street; Fairfield Road to Main Street)

- **Gordon Avenue** (2200 West to Western Border)
- **US 89** (Northern Border to Southern Border)
- **Fairfield Road** (Antelope Drive to Gentile Street)
- **Hill Field Road** (Junction with I-15)
- **2200 West** (Antelope Drive to Hill Field Road)
- **Flint Street** (Layton Parkway to Southern Border)

Intersections at or below LOS E

- **Antelope Drive and Robins Way**
- **Antelope Drive and Hill Field Road**
- **Antelope Drive and Church Street**
- **Fairfield Road and Church Street**
- **Angel Street and Gentile Street**
- **Wasatch Drive and Gentile Street**
- **Fort Lane and Gentile Street**
- **Fairfield Road and gentile Street**
- **Oak Hills Drive and Gentile Street**
- **2700 West and Layton Parkway**

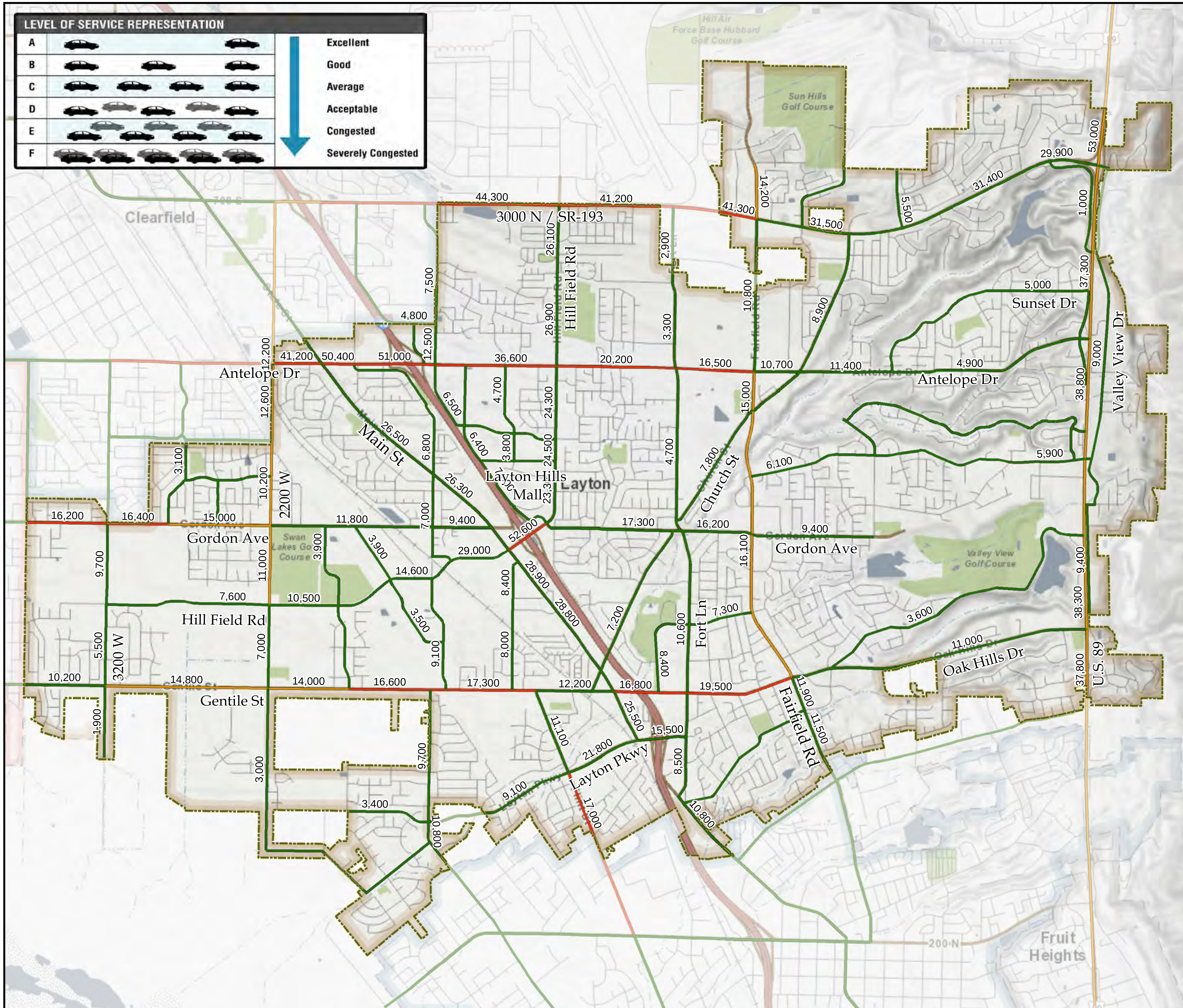

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Figure 10: 2040 No Build Level of Service

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2040 Roadway Network Conditions

Improvements will need to be made as growth occurs in order to preserve the quality of life for Layton City residents and to maintain an acceptable LOS on city streets and intersections. These improvements will also provide a sound street system that will support the City's growing economic base.

The No Build Level of Service as well as the WFRC long range plan form the basis for improving the Layton City roadway network for 2040. The WFRC long range plan is included in this TMP as **Figure 11**. The 2040 network was developed through a series of iterations with input from City staff, planning commission and the city council. The final recommended roadway network seeks to balance accommodating demand through the year 2040 with fiscal responsibility, while also considering the planning efforts of neighboring cities. Many of the neighboring cities and other jurisdictional stake holders including Kaysville City, Syracuse City, Fruit Heights City, Clearfield City, and UDOT were consulted and their input welcomed and considered during the planning process. The culmination of this analysis, as well as the efforts of the planning commission and city council, are shown as a recommended 2040 roadway network in **Figure 12**. The following paragraphs outline some of the highlights of the proposed street network.

Roadway Improvements

- **3000 North (SR-193)** (Hill Field Road to I-15): Widen to 7 lanes from Hill Field Road to I-15
- **Antelope Drive** (University Park Blvd to Main Street): Widen to 7 Lanes
- **Hill Field Road** (Gordon Avenue to Main Street): Widen to 7 Lanes
- **Gordon Avenue** (Fairfield Road to US-89): New 3 lane arterial connecting Fairfield Road to US-89 (Widen existing roadway portions)
- **Gentile Street** (Fairfield Rd to Main Street): Widen to 5 Lanes
- **2700 West** (West Davis Corridor to Hill Field Road): Widen/New Roadway to 5 Lanes
- **Fairfield Road** (Cherry Lane to Gentile Street): Widen to 5 Lanes
- **US-89** (Northern Border to Southern Border): Convert Expressway to Freeway. Add frontage roadways along the corridor
- **Layton Parkway** (End of Existing to 2700 West): New 3 Lane Arterial
- **West Davis Corridor:** New Freeway along southwest border of Layton City with an interchange at 2200 W./2700 W.
- **Oak Hills Drive** (Fairfield Drive to US-89): Widen to 5 Lanes

Intersection Improvements

- **Antelope Drive and Robins Way:** Add dual southbound lanes
- **Antelope Drive and Hill Field Road:** Add dual eastbound and westbound turning lane; add exclusive westbound right turn lane; add exclusive northbound right turn lane with turn arrow on signal
- **Antelope Drive and Church Street:** Add roundabout with a channelized right on westbound leg
- **Fairfield Road and Church Street:** Install traffic signal to improve safety
- **Angel Street and Gentile Street:** Consider realignment of Sugar Street and Angel Street
- **Wasatch Drive and Gentile Street:** Add dual eastbound and westbound through lanes; add a northbound left arrow

- **Fort Lane and Gentile Street:** Add dual eastbound and westbound through lanes; add a northbound right arrow
- **Fairfield Road and Gentile Street:** Add dual eastbound and westbound through lanes; add left turn arrows on all legs
- **Oak Hills Drive and Gentile Street:** Add a roundabout
- **2700 West and Layton Parkway:** Add a new intersection

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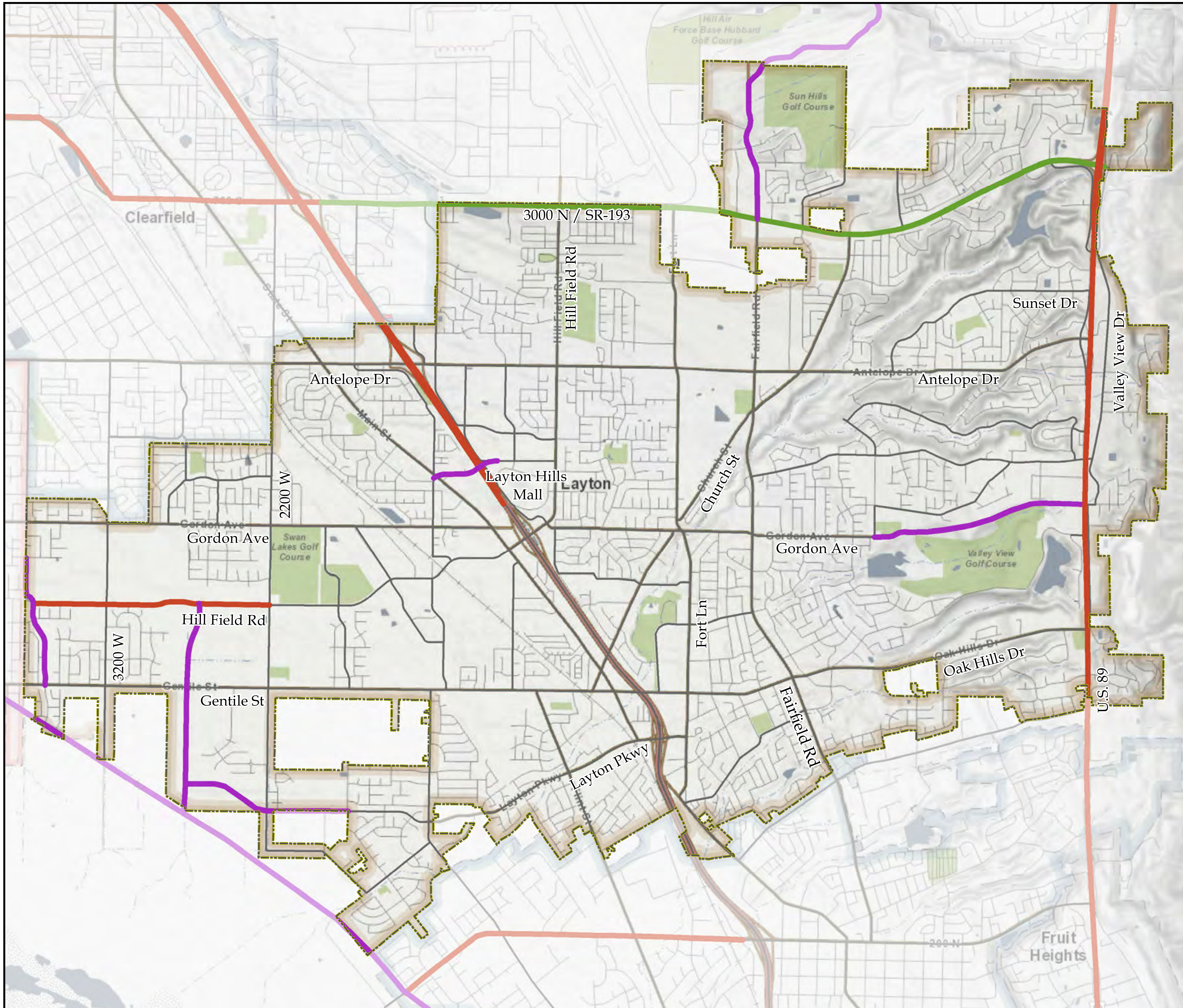
Figure 11: WFRC Long Range Transportation Plan



Legend

WFRC 2015-2040 RTP

- New Construction
- Operational
- Widening
- Layton City Boundary

N

0 0.5 1 2 Miles

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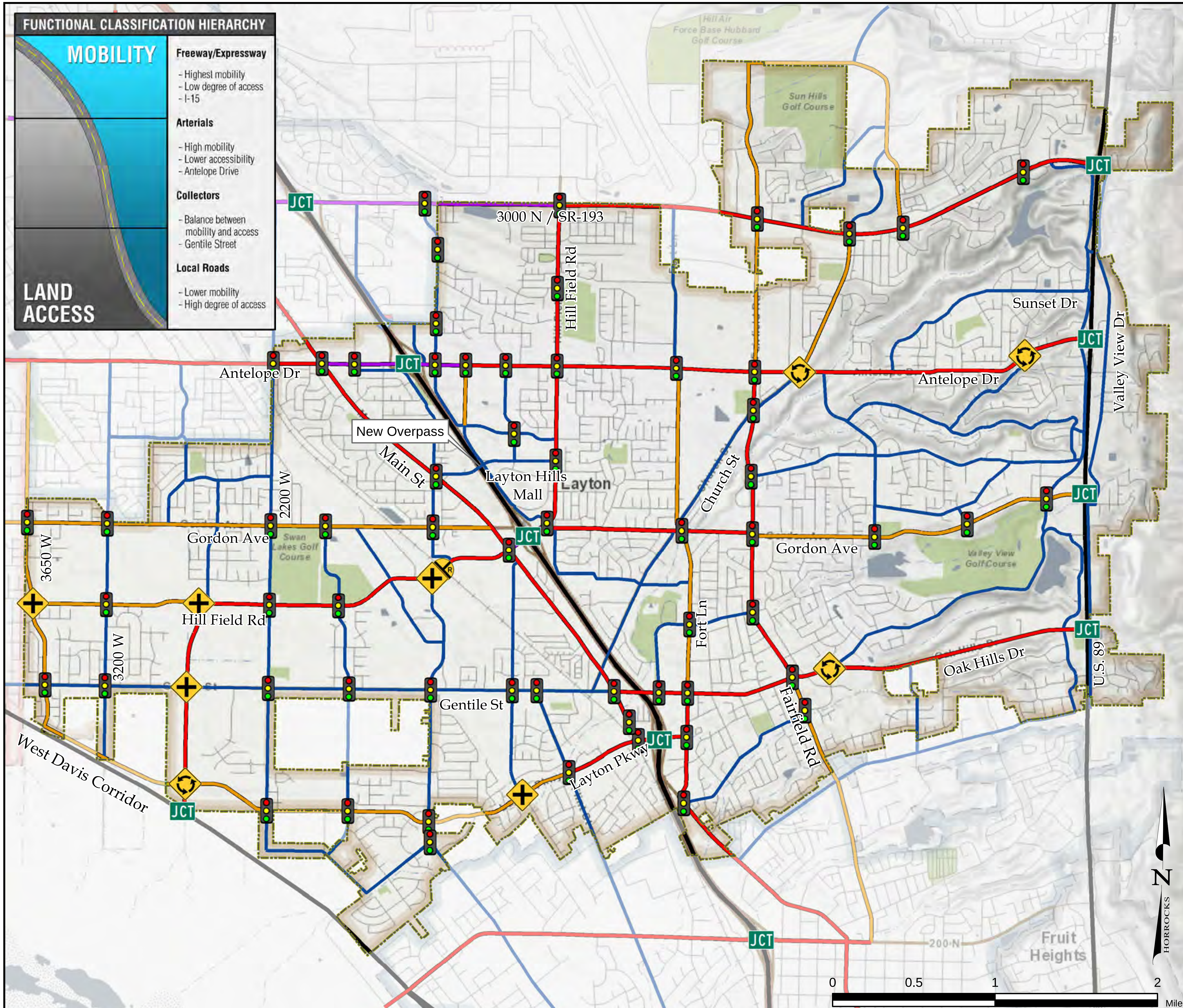

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Figure 12: 2040 Master Plan Solution

Legend

2040 Roadway Network

- Freeway
- Principal Arterial 6/7 Lanes
- Major Arterial 4/5 Lanes
- Minor Arterial 2/3 Lanes
- Collector 2/3 Lanes
- Freeway Interchange
- Traffic Signal
- Roundabout
- Intersection Treatment
- Railroad Overpass
- Layton City Boundary

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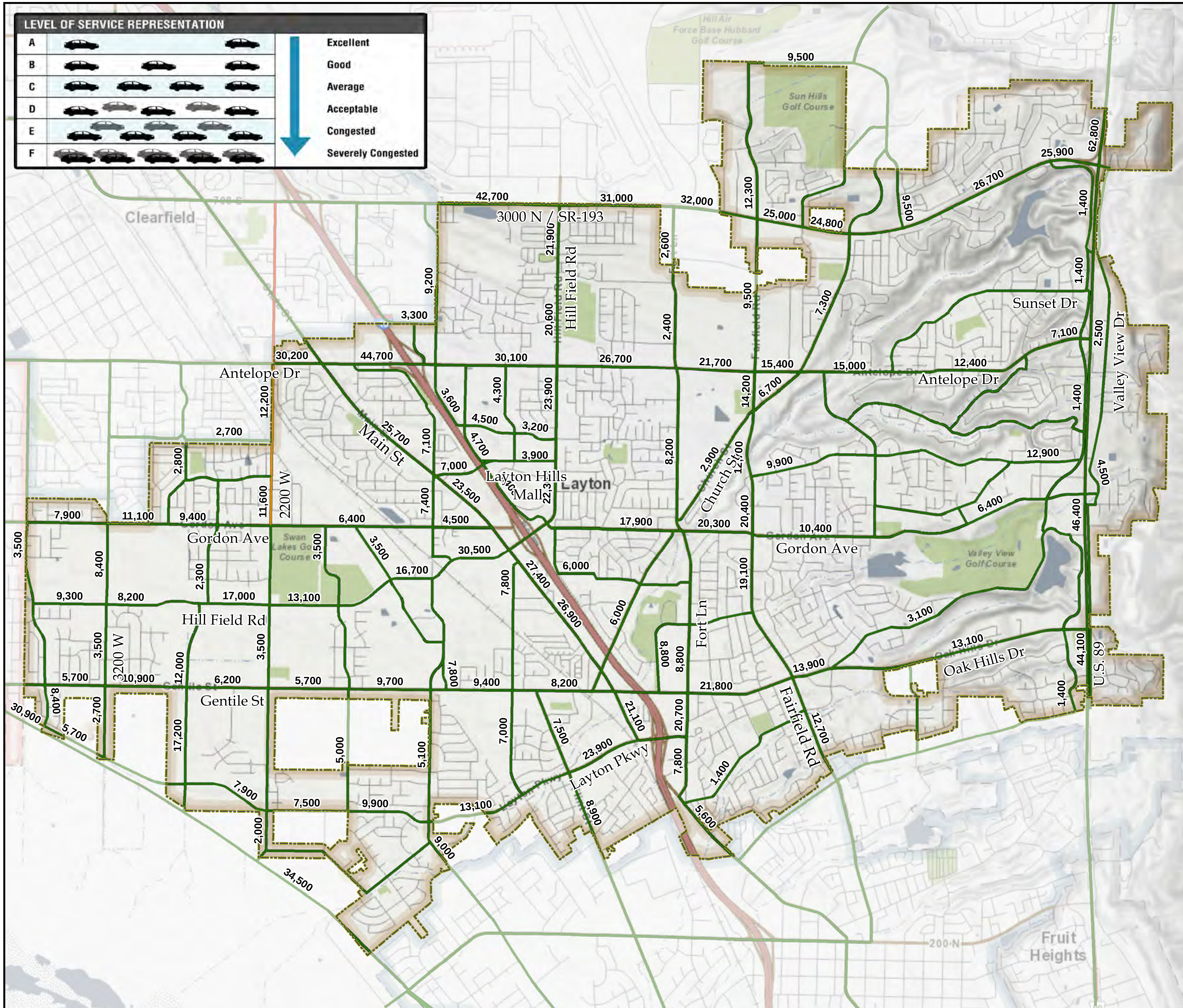
It is expected that the roadway network recommended in this document will perform at an acceptable LOS through the planning year of 2040 as shown in Figure 13. This will help in preserving the quality of life and economic vitality of the City. The specific details of the recommended roadway network are discussed more extensively in subsequent sections.

As part of this TMP, all intersections in Layton City were analyzed. Using the existing intersection LOS (see Figure 9) as well as volume projections to 2040, the proposed intersection improvements are shown in Table 7. Although Table 7 indicates the predicted intersection improvements for 2040, LOS for signals is very difficult to predict in the distant future. It is recommended that the signalized intersections in the City be regularly monitored and signal timings adjusted as needed to maintain acceptable operating conditions. Additionally, care should be taken to regularly monitor the non-signalized intersections in the City and, where appropriate, signal warrant studies should be performed to assess whether a traffic signal is warranted. Funding sources for signals should be explored and may include general funds, impact fees where appropriate and/or a special transportation improvement funds.

Table 7: Intersection Improvements for 2040

Intersection	Existing LOS	2040 No Build LOS	Recommended Improvement	Improved LOS
Antelope Drive & Robins Way	54s – D	49s – D	Dual SBL	29s – C
Antelope Drive & Hill Field Road	42s – D	76s – E	Dual EBL & WBL turn lanes; Exclusive WBR turn lane; Exclusing NBR turn lane w/ turn arrow	52s – D
Antelope Drive & Church Street	14s – B	84s – F	Roundabout with channelized WBR	33s – D
Fairfield Road & Church Street	20s – C	32s – D	Install traffic signal to improve safety	15s – B
Angel Street & Gentile Street	25s – C	20s – B	Consider aligning Sugar St w/ Angel St	20s – B
Wasatch Drive & Gentile Street	12s – B	18s – B	Dual EB & WB through lanes; install EB left turn arrow	9s – A
Fort Lane & Gentile Street	42s – D	112s – F	Dual EB & WB through lanes; add NB right turn arrow	36s – C
Fairfield Road & Gentile Street	20s – B	69s – E	Dual EB & WB through lanes; left turn arrows on all legs	32s – C
Oak Hills Drive & Gentile Street	30s – D	>180s – F	Concept Design – Roundabout	NA
2700 W & Layton Pkwy	NA	NA	New Intersection (see interchange concept)	13s – B
Weaver Lane & Angel Street	46s – E	>180s – F	Install traffic signal and an exclusive NB left turn lane	10s – B



Master Transportation Plan

FIGURE 13: 2040 MASTER PLAN LEVEL OF SERVICE

Legend
- Acceptable (LOS D or Better)
- Unacceptable (LOS E)
- Unacceptable (LOS F)
- Layton City Boundary

0 0.5 1 2 Miles

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Capital Facilities Plan

As growth continues in Layton City, the roadway network will need to be improved by constructing new roads, widening existing transportation corridors, and making intersection improvements to provide future residents of the city with an adequate transportation system. A concept plan for future growth between the planning years of 2012-2040 is provided in **Figure 12**.

Transportation Needs as a Result of New Development

The specific roadway network needs resulting from future growth throughout Layton City are identified in **Figure 14**. Updating **Figure 14** is necessary since project scopes change and development occurs throughout the City. All projects necessary to improve the roadway network were identified and compiled into tables to produce a Transportation Improvement Plan (TIP). All projects under Layton City's and UDOT's jurisdictions are found in **Table 8** and **Table 9**

Table 9respectively.

Many of the identified projects are for UDOT roads or roads which would be eligible for WFRC funding. Where a planned project occurs on a UDOT road, it is assumed that the City would not participate in funding that project. In the case of WFRC eligible roadways, the City would be responsible for an approximate 8% match of the total project cost. This 8% would be need to be funded by the City with a mechanism such as impact fees.

In cases where UDOT and WFRC would not participate in funding a particular project, Layton City may share the cost of the roadway with the development community in cases where those projects are the result of new growth. The cost of a roadway widening would be 100% the responsibility of the City but may be funded using impact fees. Where new roads are planned, adjacent developers would be responsible for the construction costs of a local street section (the minimum requirement to access their individual development). The City would be required to fund any improvements beyond that of a local street section, for example a collector or arterial street section where planned. The City portion of the cost for new roads will be funded by impact fees at 100%. See **Appendix C: Cost Estimates** for more details.

The cost estimates shown, in cooperation with City officials, represent the costs of construction, right-of-way, and engineering. All costs represent 2015 costs. Project timing should be determined by development and transportation needs. It is expected that the total cost of roadway improvements funded by Layton City for 2040 will be approximately **$45,427,000**.

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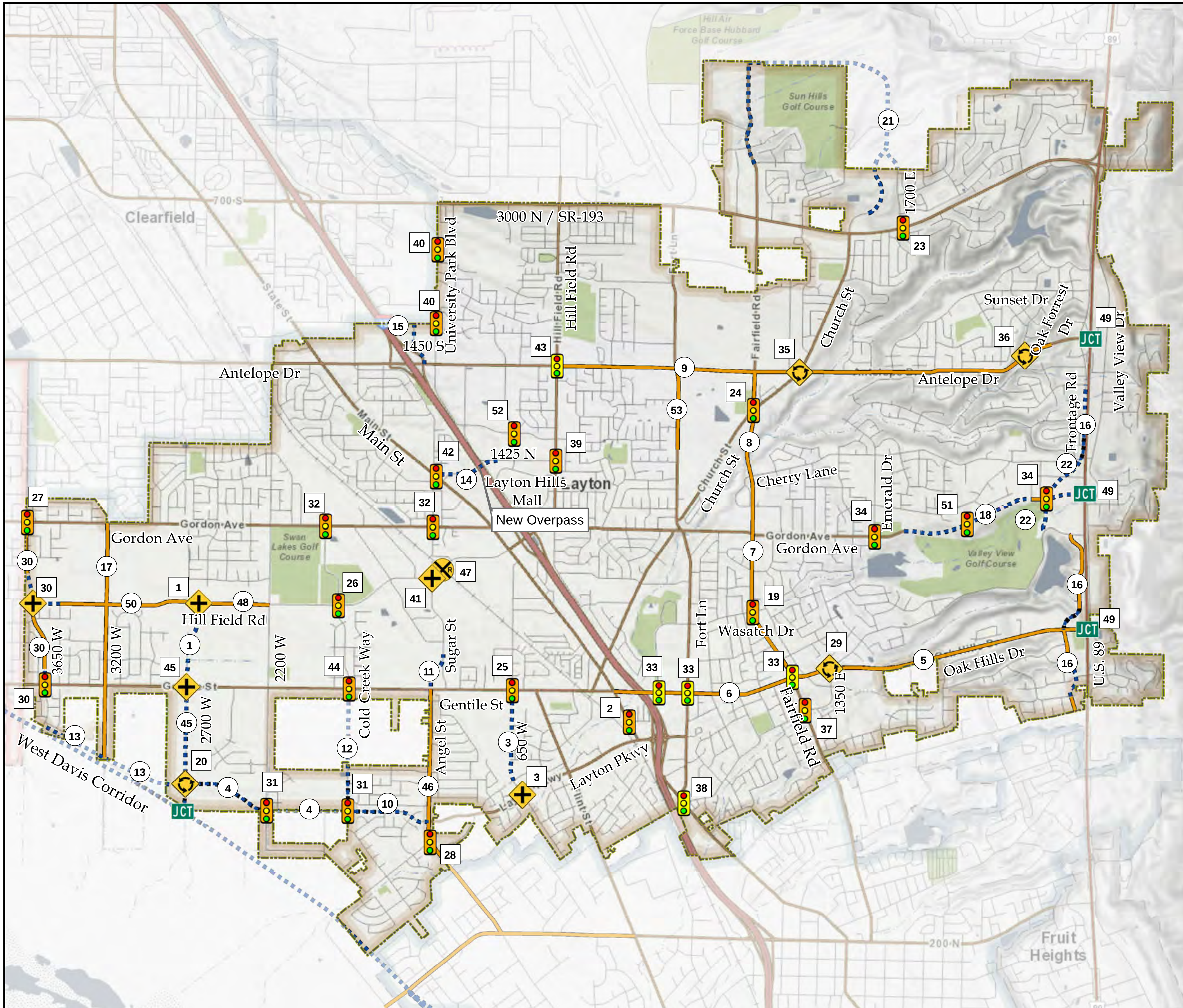
Figure 14: Proposed Roadway Projects



Legend

Proposed Roadway Projects

- New Roadway
- Capacity Improvement
- JCT Proposed Interchange
- Proposed Signal
- Proposed Signal Modification
- Intersection Treatment
- Roundabout
- Railroad Overpass
- Layton City Boundary

16 Roadway Project Number

49 Intersection Project Number

N

0 0.5 1 2 Miles

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Table 8: Capital Facilities Plan - Layton City Responsibility

Capital Facilities Plan – Layton City Responsibility						
No.	**Location**	**Total Price**	**Funding Source**	**Range (Yr)**	**Layton City %**	**Layton City Total**
1	2700 West: West Hillfield Road to Gentile Street	$4,899,000	Layton	2025	42%	$2,041,000
2	Traffic Signal: 200 South and Main Street	$340,000	Layton	2040	100%	$340,000
3	650 West: Weaver Lane to Gentile St	$3,647,000	Layton	2040	15%	$541,000
4	Layton Parkway: 1700 West to 2700 West	$3,591,000	Layton	2025	29%	$1,039,000
6	Gentile St.: Main Street (SR-126) to Fairfield Rd	$5,434,000	Layton/UDOT	2025	7%	$973,000
7	Fairfield Road: Gentile Street to Cherry Lane	$274,000	Layton	2040	100%	$274,000
8	Fairfield Road: Cherry Lane to Antelope Drive	$2,439,000	Layton	2040	100%	$2,439,000
9	Antelope Drive: Hill Field Rd. to Oak Forest	$248,000	Layton	2040	100%	$248,000
10	Layton Parkway: Angel (1200 West) to 1700 West	$3,728,000	Layton	2025	29%	$1,079,000
11	Angel Street and Sugar Street Connection	$1,125,000	Layton	2025	100%	$1,125,,000
12	1700 West: Gentile St to Layton Pkwy	$5,287,000	Layton	2040	15%	$784,000
13	Layton Parkway: 2700 West to Bluff Ridge Blvd	$6,700,000	Layton	2040	29%	$1,939,000
15	Frontage Road: 2000 North to 1450 South	$752,000	Layton	2025	100%	$752,000
17	3200 West: Layton Parkway to Gordon	$3,303,000	Layton	2040	100%	$3,303,000
18	Gordon Ave: 1800 East to Highway 89	$8,010,000	Layton	2025	100%	$8,010,000
19	Signal: Wasatch Drive and Fairfield Road	$272,000	Layton	2025	100%	$272,000
20	Roundabout: 2700 West and Layton Parkway	$650,000	Layton	2025	100%	$650,000
21	Eastridge Business Loop: Fairfield Rd (End of Existing) to Church St	$5,863,000	Layton	2040	15%	$869,000
24	Signal: Fairfield Road and Church Street	$272,000	Layton	2025	100%	$272,000

Capital Facilities Plan – Layton City Responsibility						
No.	Location	Total Price	Funding Source	Range (Yr)	Layton City %	Layton City Total
25	Signal: Gentile Street and 650 West	$272,000	Layton	2025	100%	$272,000
26	Signal: Hill Field Road and Cold Creek Way	$272,000	Layton	2025	100%	$272,000
27	Signal: Gordon Avenue and 3700 West	$272,000	Layton	2040	100%	$272,000
28	Signal: Weaver Lane and Angel Street	$272,000	Layton	2025	100%	$272,000
29	Roundabout: Oak Hills Drive and Gentile Street	$378,000	Layton	2025	100%	$378,000
30	3650 West: Gordon Ave to Gentile Street	$2,877,000	Layton	2025	29%	$835,000
31	Signals: Layton Pkwy at 1700 West & 2200 West	$544,000	Layton	2025	100%	$544,000
32	Signals: Gordon Ave at 1200 West (Angel St) and Cold Creek Way	$544,000	Layton	2025	100%	$544,000
33	Signal Modifications: Gentile Street at Wasach Drive, Fort Lane and Fairfield Road	$816,000	Layton	2025	15%	$123,000
34	Signals: Gordon Ave at Emerald Drive and 2600 East	$544,000	Layton	2025	100%	$544,000
35	Roundabout: Antelope Drive and Church Street	$680,000	Layton	2025	100%	$680,000
36	Roundabout: Antelope Drive and Oak Forest Drive	$200,000	Layton	2025	100%	$200,000
37	Signal: Fairfield Road and Rosewood Lane	$272,000	Layton	2040	100%	$272,000
38	Signal: Main Street and Fort Lane	$272,000	Layton	2040	100%	$272,000
40	Signals: University Park Blvd and 2600 North	$272,000	Layton	2040	100%	$272,000
41	Signal: West Hillfield and Sugar Street	$272,000	Layton	2025	100%	$272,000
43	Signal: Antelope and Hillfield Road	$272,000	Layton	2025	100%	$272,000
44	Signal: Gentile and Cold Creek Way	$272,000	Layton	2040	100%	$272,000
45	2700 West: Gentile Street to West Davis Corridor	$8,814,000	Layton	2025	42%	$3,671,000

Capital Facilities Plan – Layton City Responsibility						
No.	**Location**	**Total Price**	**Funding Source**	**Range (Yr)**	**Layton City %**	**Layton City Total**
46	Angel Street: Gentile Street to Kaysville Border	$1,742,000	Layton	2025	100%	$1,742,000
47	Hill Field Road: Railroad Crossing	$29,445,000	Layton/WFRC	2040	8%	$2,356,000
48	Hill Field Road: 2200 West to 2700 West	$2,720,000	Layton	2040	42%	$1,133,000
50	West Hillfield Road: 2700 West to 3650 West	$4,365,000	Layton	2040	29%	$1,263,000
51	Signal: 2100 East and Gordon Avenue	$272,000	Layton	2025	100%	$272,000
52	Signal: Heritage Park and Layton Hills Parkway	$272,000	Layton	2025	100%	$272,000
53	Fort Lane: 1500 North to Antelope Drive	$1,200,000	Layton	2040	100%	$1,200,000
	Total	**$95,718,000**				**$45,427,000**

Table 9: Capital Facilities Plan - UDOT Responsibility

Capital Facilities Plan – UDOT Responsibility						
No.	**Location**	**Total Price**	**Funding Source**	**Range (Yr)**	**Layton City %**	**Layton City Total**
5	Oaks Hill Drive: US-89 to Fairfield Rd.	$8,933,000	UDOT	2040	0%	$0
14	1425 North 1-15 Overpass: Main Street to Hillfield Road	$15,026,000	UDOT	2025	0%	$0
16	Frontage Road to US-89: Mutton Hollow Road to 1000 North (West Side)	$3,005,000	UDOT	2025	0%	$0
23	Signal: SR-193 and 1700 East	$272,000	UDOT	2025	0%	$0
39	Signal: Hill Field Road and 1425 North	$272,000	UDOT	2025	0%	$0
42	Signal: Main Street and 1425 Bridge Overpass	$272,000	UDOT	2025	0%	$0
49	US-89 Interchanges	$275,000,000	UDOT	2025	0%	$0
	Total	**$302,780,000**				**$0**

Proposed Means to Meet Demands of New Development

All possible revenue sources have been considered as a means of financing transportation capital improvements needed as a result of new growth. This section discusses the potential revenue sources that could be used to fund transportation needs as a result of new development.

Transportation routes often span multiple jurisdictions and provide regional significance to the transportation network. As a result, other government jurisdictions or agencies often help pay for such regional benefits. Those jurisdictions and agencies could include the Federal Government, the State Government or UDOT, or WFRC. The City will need to continue to partner and work with these other jurisdictions to ensure the adequate funds are available for the specific improvements necessary to maintain an acceptable LOS. The City will also need to partner with adjacent communities to ensure corridor continuity across jurisdictional boundaries (i.e., arterials connect with arterials; collectors connect with collectors, etc.).

Funding sources for transportation are essential if Layton City recommended improvements are to be built. The following paragraphs further describe the various transportation funding sources available to the City.

Federal Funding

Federal monies are available to cities and counties through the federal-aid program. UDOT administers the funds. In order to be eligible, a project must be listed on the five-year Statewide Transportation Improvement Program (STIP).

The Surface Transportation Program (STP) funds projects for any roadway with a functional classification of a collector street or higher as established on the Functional Classification Map. STP funds can be used for both rehabilitation and new construction. The Joint Highway Committee programs a portion of the STP funds for projects around the state in urban areas. Another portion of the STP funds can be used for projects in any area of the state at the discretion of the State Transportation Commission. Transportation Enhancement funds are allocated based on a competitive application process. The Transportation Enhancement Committee reviews the applications and then a portion of the application is passed to the State Transportation Commission. Transportation enhancements include 12 categories ranging from historic preservation, bicycle and pedestrian facilities and water runoff mitigation. Other federal and state trail funds are available from the Utah State Parks and Recreation Program.

WFRC accepts applications for federal funds through local and regional government jurisdictions. The WFRC Technical Advisory and Regional Planning committees select projects for funding annually. The selected projects form the Transportation Improvement Program (TIP). In order to receive funding, projects should include one or more of the following aspects:

- **Congestion Relief** – spot improvement projects intended to improve Levels of Service and/or reduce average delay along those corridors identified in the Regional Transportation Plan as high congestion areas
- **Mode Choice** – projects improving the diversity and/or usefulness of travel modes other than single occupant vehicles

- **Air Quality Improvements** – projects showing demonstrable air quality benefits
- **Safety** – improvements to vehicular, pedestrian, and bicyclist safety

State/County Funding

The distribution of State Class B and C Program monies is established by State Legislation and is administered by the State Department of Transportation. Revenues for the program are derived from State fuel taxes, registration fees, driver license fees, inspection fees, and transportation permits. Seventy-five percent of these funds are kept by UDOT for their construction and maintenance programs. The rest is made available to counties and cities. As many of the roads in Layton fall under UDOT jurisdiction, it is in the interests of the City that staff is aware of the procedures used by UDOT to allocate those funds and to be active in requesting the funds be made available for UDOT owned roadways in the City.

Class B and C funds are allocated to each city and county by a formula based on population, centerline miles, and land area. Class B funds are given to counties, and Class C funds are given to cities and towns. Class B and C funds can be used for maintenance and construction projects; however, thirty percent of those funds must be used for construction or maintenance projects that exceed $40,000. The remainder of these funds can be used for matching federal funds or to pay the principal, interest, premiums, and reserves for issued bonds.

In 2005 the state senate passed a bill providing for the advance acquisition of right-of-way for highways of regional significance. This bill would enable cities in the county to better plan for future transportation needs by acquiring property to be used as future right-of-way before it is fully developed and becomes extremely difficult to acquire. UDOT holds on account the revenue generated by the local corridor preservation fund but the county is responsible to program and control monies. In order to qualify for preservation funds, the City must comply with the Corridor Preservation Process found at the flowing link www.udot.utah.gov/public/ucon and also provided in the appendix of this report. Currently, Layton City uses Class C funding for their transportation projects.

City Funding

Some cities utilize general fund revenues for their transportation programs. Another option for transportation funding is the creation of special improvement districts. These districts are organized for the purpose of funding a single specific project that benefits an identifiable group of properties. Another source of funding used by cities includes revenue bonding for projects intended to benefit the entire community.

Private interests often provide resources for transportation improvements. Developers construct the local streets within subdivisions and often dedicate right-of-way and participate in the construction of collector/arterial streets adjacent to their developments. Developers can also be considered a possible source of funds for projects through the use of impact fees. These fees are assessed as a result of the impacts a particular development will have on the surrounding roadway system, such as the need for traffic signals or street widening.

General fund revenues are typically reserved for operation and maintenance purposes as they relate to transportation. However, general funds could be used if available to fund the expansion or introduction of specific services. The City of Layton currently uses Class C funding for their transportation improvements. Providing a line item in the City budgeted general funds to address roadway improvements, which are not impact fee eligible is a recommended practice to fund transportation projects should other funding options fall short of the needed amount.

General obligation bonds are debt paid for or backed by the City's taxing power. In general, facilities paid for through this revenue stream are in high demand amongst the community. Typically, general obligation bonds are not used to fund facilities that are needed as a result of new growth because existing residents would be paying for the impacts of new growth. As a result, general obligation bonds are not considered a fair means of financing future facilities needed as a result of new growth.

Certain areas might require different needs or methods of funding other than traditional revenue sources. A Special Assessment Area (SAA) can be created for infrastructure needs that benefit or encompass specific areas of the City. Creation of the SAA may be initiated by the municipality by a resolution declaring the public health, convenience, and necessity requiring the creation of a SAA. The boundaries and services provided by the district must be specified and a public hearing held prior to creation of the SAA. Once the SAA is created, funding can be obtained from tax levies, bonds, and fees when approved by the majority of the qualified electors of the SAA. These funding mechanisms allow the costs to be spread out over time. Through the SAA, tax levies and bonding can apply to specific areas in the City needing to benefit from the improvements.

Interfund Loans

Since infrastructure must generally built ahead of growth, it must sometimes be funded before expected impact fees are collected. Bonds are the solution to this problem in some cases. In other cases, funds from existing user rate revenue will be loaned to the impact fee fund to complete initial construction of the project. As impact fees are received, they will be reimbursed. Consideration of these loans will be included in the impact fee analysis and should be considered in subsequent accounting of impact fee expenditures.

Developer Dedications and Exactions

Developer dedications and exactions can both be credited against the developer's impact fee analysis. If the value of the developer dedications and/or extractions are less than the developer's impact fee liability, the developer will owe the balance of the liability to the city. If the dedications and/or extractions of the developer are greater than the impact fee liability, the city must reimburse the developer the difference.

Developer Impact Fees

Impact fees are a way for a community to obtain funds to assist in the construction of infrastructure improvements resulting from and needed to serve new growth. The premise behind impact fees is that if no new development occurred, the existing infrastructure would be adequate. Therefore, new developments should pay for the portion of required improvements that result from new growth. Impact fees are assessed for many types of infrastructures and facilities that are provided by a community, such as roadway facilities. According to state law, impact fees can only be used to fund growth related system improvements.

Alternative Modes of Transportation

Accommodating alternative modes of transportation is a vital consideration when planning a livable and sustainable community. As a vibrant and growing city, it is important for Layton City to continue to plan for improved transit, trails, and pedestrian facilities. These facilities will improve the overall quality of life of the residents while aiding in congestion relief and increasing the lifespan of the City's roadway network.

Non-Motorized Traffic

Pedestrian and bicycle safety is an important feature of any transportation master plan. People will be more inclined to walk or ride their bicycle when the experience is pleasant, they feel safe, and distances are reasonable. High-density housing near high-traffic generators or main street type areas encourages people to use alternative travel options from the automobile. In order to create a more connected and complete trail system, each of the roads that appear on both the Transportation Master Plan and the Preliminary Bicycle and Pedestrian Recommendations Map (shown in **Figure 15**) will include bicycle facilities. The design guidelines set forth in the Trails Master Plan should be followed when planning and constructing additional trails.

The following descriptions of bicycle-related terms are provided to assist readers who are unfamiliar with bicycle terminology. The terms bicycle and bike are used interchangeably.

- **Bikeway** - A thoroughfare suitable for bicycles - it may either exist within the right-of-way of other modes of transportation, such as highways, or along a separate and independent corridor.
- **Bicycle Facilities** - A general term denoting improvements and provisions to accommodate or encourage bicycling, including parking facilities, maps, all bikeways, and shared roadways.
- **Bicycle or Multi-use Path (Bike Path or Class 1)** - A bikeway physically separated from motorized vehicular traffic and either within the highway right-of-way or within an independent right-of-way. Bike path facilities are often excellent recreational routes and can be developed where right-of-way is available. Typically, bike paths are a minimum of 10 feet to 12 feet wide, with an additional graded area maintained on each side of the path.
- **Bicycle Lane (Bike Lane or Class 2)** - A portion of a roadway that has been designated by striping, signing, and pavement markings for the preferential or exclusive use of bicyclists. Bike lanes are ideal for minor thoroughfares or collectors. Under certain conditions, bike lanes may be beneficial on streets with significant traffic volumes and/or speeds. Under ideal conditions, minimum bike lane width is four feet.
- **Signed Bike Route (Class 3)** - A segment of a system of bikeways designated by appropriate directional and/or informational signs. In this plan, a Class 3 signed bike route may be a local or residential street, Bicycle Boulevard, an arterial with wide outside lanes, or a roadway with a paved shoulder.

- **Paved Shoulder** - The part of the highway that is adjacent to the regularly traveled portion of the highway, is on the same level as the highway, and when paved can serve as a bikeway. Paved shoulders should be at least four feet wide, and additional width is desirable in areas where speeds are high and/or a large percentage of trucks use the roadway.
- **Wide Outside Lane** - An outside (curb) lane on a roadway that does not have a striped bike lane, but is of sufficient width for a bicyclist and motorist to share the lane with a degree of separation. A width of 14 feet is recommended to safely accommodate both motor vehicles and bicycles.
- **Bicycle Boulevard** - A residential street that has been modified for bicyclist safety and access.

Bicycle and pedestrian crossings are an important part of the transportation network. An analysis containing existing and future bike lanes and trails as well as pedestrian and bike crossings is included in this TMP. The trails map shown in **Figure 15** identifies areas of the city where trails and bike facilities are recommended. Wherever these facilities intersect a roadway, a safe and convenient crossing should be installed. These crossings can come in the form of standard pedestrian crossings at intersections, midblock HAWK signal crossings, grade separated bridges and tunnels, or standard pedestrian midblock crossings. Each crossing location must be treated individually and should follow the guidelines set forth in the MUTCD. The MUTCD also provides a specific set of criteria for when a pedestrian crossing is warranted based on vehicular and pedestrian traffic, proximity to high pedestrian generators such as schools, and safety considerations. In each case an engineering study should be performed before an at-grade pedestrian crossing is installed.

As part of this TMP, the bicycle and pedestrian policy as well as the cross sections and design guidelines were updated. The findings are included in this sections and detailed reports are found in **Appendix E: Biking and Walking Elements** and **Appendix F: Cross Section and Design Guidelines**.

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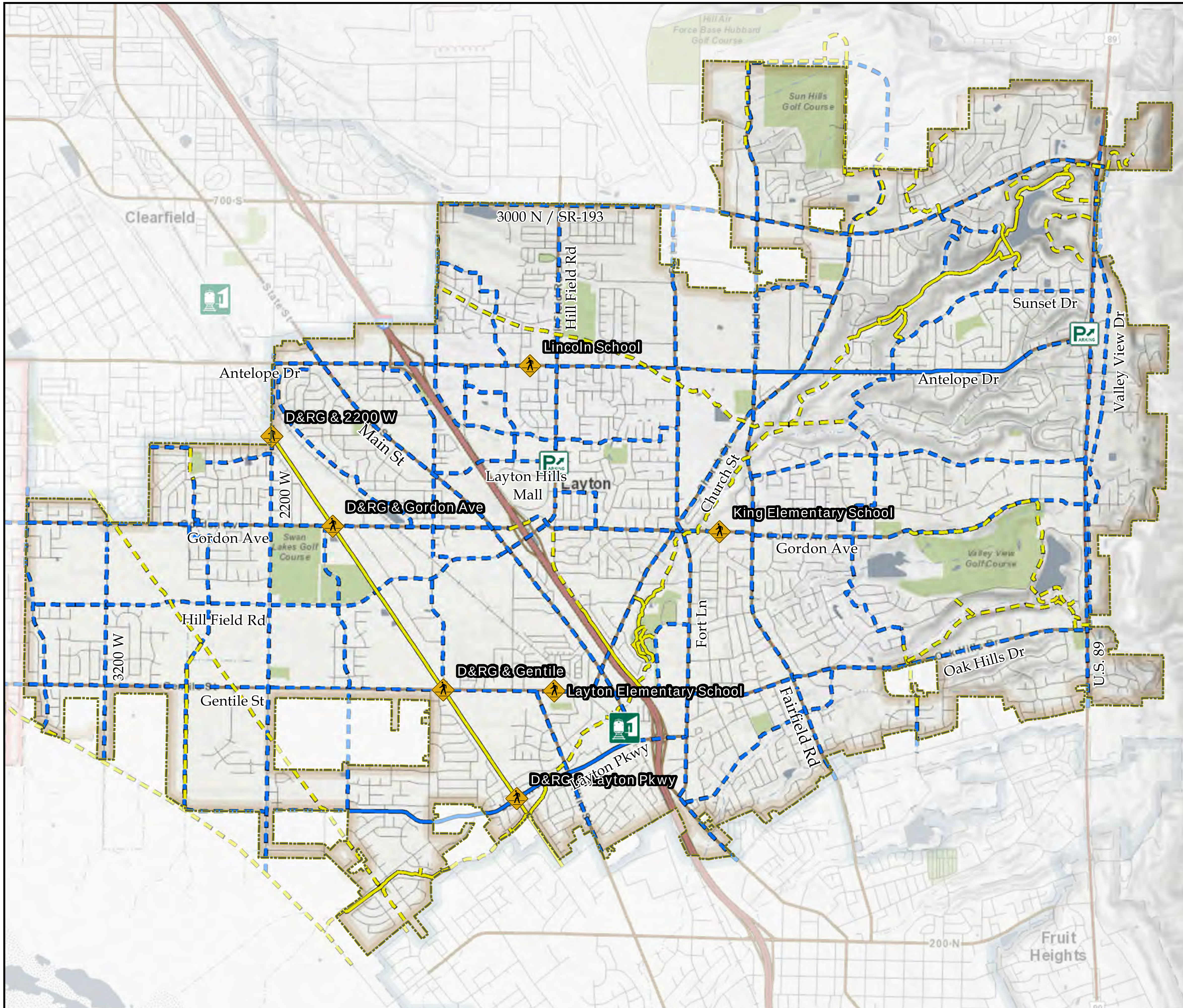
Figure 15: Bicycle and Pedestrian Paths



Legend

- Frontrunner Station
- Park and Ride Location
- Pedestrian Crossing
- Existing On-Street
- Existing Off-Street
- Recommended On-Street
- Recommended Off-Street
- Layton City Boundary

* For more information, please refer to the Layton City Parks, Recreation, Trails, Open Space, & Culteral Facilities Master Plan

N

0 0.5 1 2 Miles

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Layton Bicycle and Pedestrian Policy Review

Various Layton City policies were reviewed to determine their effect on bicycling and walking. A "best practices" review was then conducted in the area of bicycle and pedestrian-related policies to develop appropriate recommendations that the City can modify and/or adopt. Basic descriptions of the recommended changes and additions are given in this memo along with information about where the City may find more detailed resources (if applicable) about the recommended policies.

As part of this plan, the following was reviewed:

- City of Layton General Plan
- City of Layton Municipal Code

The full policy and regulatory review is provided in the attached policy matrix included in **Appendix E: Biking and Walking Elements**.

Key Findings

Layton City has a number of very positive policies, codes, ordinances, and regulations that support walkable and bikeable environments. However, it is also evident that the City could significantly strengthen many areas of policy and code regarding facility definitions and standards, general support of pedestrian and bicyclist safety, traffic calming, walkable neighborhoods, access to schools, required bicycle parking, bicycle and pedestrian facility requirements, and enhancements within the context of development ordinances. Policies and standards geared toward making Layton safer and more welcoming for bicycling and walking are recommended and discussed within the attached policy matrix. Error! Reference source not found. below describes key strengths identified within the existing ordinances and policies of the City, as well as priority areas for improvement.

Cross Sections and Design Guidelines

These treatments and design guidelines are important because they represent the tools for creating a bicycle and pedestrian-friendly, safe, accessible community. The guidelines are not, however, a substitute for a more thorough evaluation by a landscape architect or engineer upon implementation of facility improvements. Some improvements may also require cooperation with the Utah DOT for specific design solutions. The following standards and guidelines are referred to in this guide. Please refer to **Appendix F: Cross Section and Design Guidelines** for more information.

The Federal Highway Administration's **Manual on Uniform Traffic Control Devices** (MUTCD) is the primary source for guidance on lane striping requirements, signal warrants, and recommended signage and pavement markings.

American Association of State Highway and Transportation Officials (AASHTO) **Guide for the Development of Bicycle Facilities**, updated in June 2012 provides guidance on dimensions, use, and layout of specific bicycle facilities.

Offering similar guidance for pedestrian design, the 2004 AASHTO **Guide for the Planning, Design and Operation of Pedestrian Facilities** provides comprehensive guidance on planning and designing for people on foot.

The National Association of City Transportation Officials' (NACTO) 2012 **Urban Bikeway Design Guide** is the newest publication of nationally recognized bikeway design standards, and offers guidance on the current state of the practice designs.

Meeting the requirements of the Americans with Disabilities Act (ADA) is an important part of any bicycle facility project. The United States Access Board's proposed **Public Rights-of-Way Accessibility Guidelines** (PROWAG) and the **2010 ADA Standards for Accessible Design** (2010 Standards) contain standards and guidance for the construction of accessible facilities.

Should the national standards be revised in the future and result in discrepancies with this chapter, the national standards should prevail for all design decisions.

Strengths

- General ordinance supporting pedestrian and bicycle safety
- Maximum block sizes in residential and agricultural zones
- Pedestrian accommodations in parking lots in mixed use zones
- Good ordinance language requiring property owner participation in sidewalk maintenance
- Good language prohibiting obstructions to sidewalks
- Good language requiring overhangs and shelters to protect pedestrians in mixed use zones

Priority Areas for Improvement

- Develop a comprehensive Complete Streets Ordinance
- Require pedestrian improvements with new development and redevelopment (sidewalks, lighting, street trees, etc.)
- Develop citywide bicycle parking requirements
- Update suburban, auto-oriented development standards to be more context-based and pedestrian-friendly
- Develop policy and ordinances for required width and installation of sidewalks
- Expand the walking and bicycling-friendly requirements that exist in mixed use zones to all non-residential and non-agricultural zones in the City

Conclusions

It is clear that adapting best practices from across the country into the existing code would serve as an efficient approach to improving existing conditions while facilitating new walkable and bikeable development. The City's development standards are primarily oriented towards automobile access. Walkability begins with access to destinations through the minimization of out of direction travel, compact distances, and a pleasant overall aesthetic. To the extent politically feasible, the City and its partners in the County and State agencies should promote development that is proximate to existing infrastructure, residential development, and existing destinations for education, employment, commerce, and civic activities. This begins with allowing and promoting a mixture of land uses and at a density that supports walking and bicycle access. Walkable land use patterns are critical to quality of life Layton residents and visitors

Promoting "complete" infrastructure and transportation linkages between land uses will help ensure that destinations within Layton that are proximate in distance are indeed comfortable and safe to walk or bike to and from. Pedestrian and bicycle access should be considered in every applicable requirement and ordinance, like the development of sidewalks, provision of bicycle parking and street trees, and pedestrian-scaled lighting. Standards should also consider whether or not building and lots are oriented for pedestrian and bicycle access.

The comments and recommendations in the attached policy matrix outline many opportunities for making local development standards more pedestrian and bicycle friendly. This plan suggests that City staff and appropriate appointed committees develop proposed text amendments they consider easy to accomplish in the short term. For more structural changes, staff, committees, and the Plan committee members should incorporate changes into the upcoming comprehensive audit and rewrite of development standards over the next 12-18 months. The outcome of such an effort will be development standards that are predictable and sustainable for investors and developers, but that also promote active living, aging in place, quality of life, the local character of Layton, and transportation and recreation choices.

The Layton City Parks and Recreation Department is currently updating their *City Parks, Recreation, Trails, Open Space & Cultural Facilities Master Plan*. The latest draft can be found through the Parks and Recreation webpage at www.laytoncity.org.

Transit Service

The Utah Transit Authority (UTA) is the provider of public transportation throughout the Wasatch Front. UTA operates fixed route buses, express buses, bus rapid transit (BRT), ski buses, light rail, and commuter rail. In this capacity, UTA is responsible for the operation of the transit network in Layton City. It is the responsibility of both Layton City and UTA to cooperate to provide transit planning to accommodate alternative transportation options to residents as demand increases. The following are existing transit routes and days of service that are in operation in Layton City and is also included in **Figure 16** (UTA maintains up-to-date route information at www.rideuta.com):

- **Bus Route 455**: Monday – Friday (No Weekend Service)
- **Bus Route 456**: Monday – Friday (No Weekend Service)
- **Bus Route 470**: Monday – Sunday
- **Bus Route 472**: Monday – Friday (No Weekend Service)
- **Bus Route 473**: Monday – Friday (No Weekend Service)
- **Bus Route 477**: Monday – Friday (No Weekend Service)
- **Bus Route 626**: Monday – Friday (No Weekend Service)
- **Bus Route 627**: Monday – Friday (No Weekend Service)
- **Bus Route 640**: Monday – Saturday (No Sunday Service)
- **FrontRunner 750**: Monday – Saturday (No Sunday Service)

The combined efforts of the Utah Transit Authority (UTA), UDOT, WFRC, and Layton City will largely dictate the nature of a future expanded transit system. Included in this TMP is the WFRC long range transit plan as shown in **Figure 17**. Included in this plan is to enhance bus service, the introduction of BRT on Main Street as well as improving Frontrunner service.

Layton City should be actively involved in supporting transit as a viable and attractive alternative transportation mode in the city. These planning and lobbying efforts will assist in procuring the necessary funding and support to develop, implement, and maintain a sustainable transit system. The UTA bus system is versatile as routes and stops can be adjusted as the demand and other factors require it.

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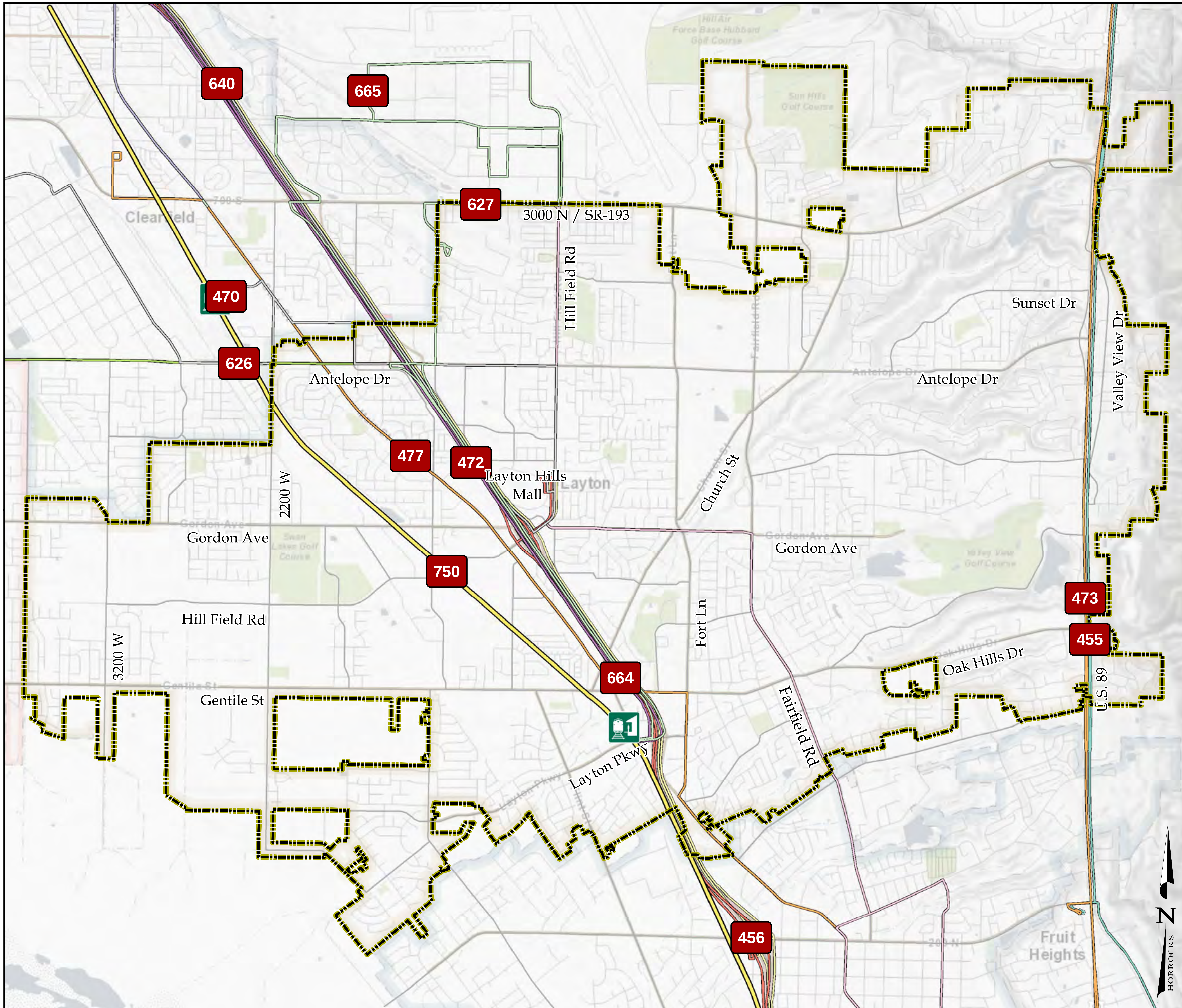
Figure 16: UTA Transit Routes



Legend

UTA Routes

- 664
- 455
- 456
- 470
- 472
- 473
- 477
- 626
- 627
- 640
- 665
- Frontrunner (750)
- Frontrunner Station
- Roadway Network
- Layton City Boundary

0 0.5 1 2 Miles

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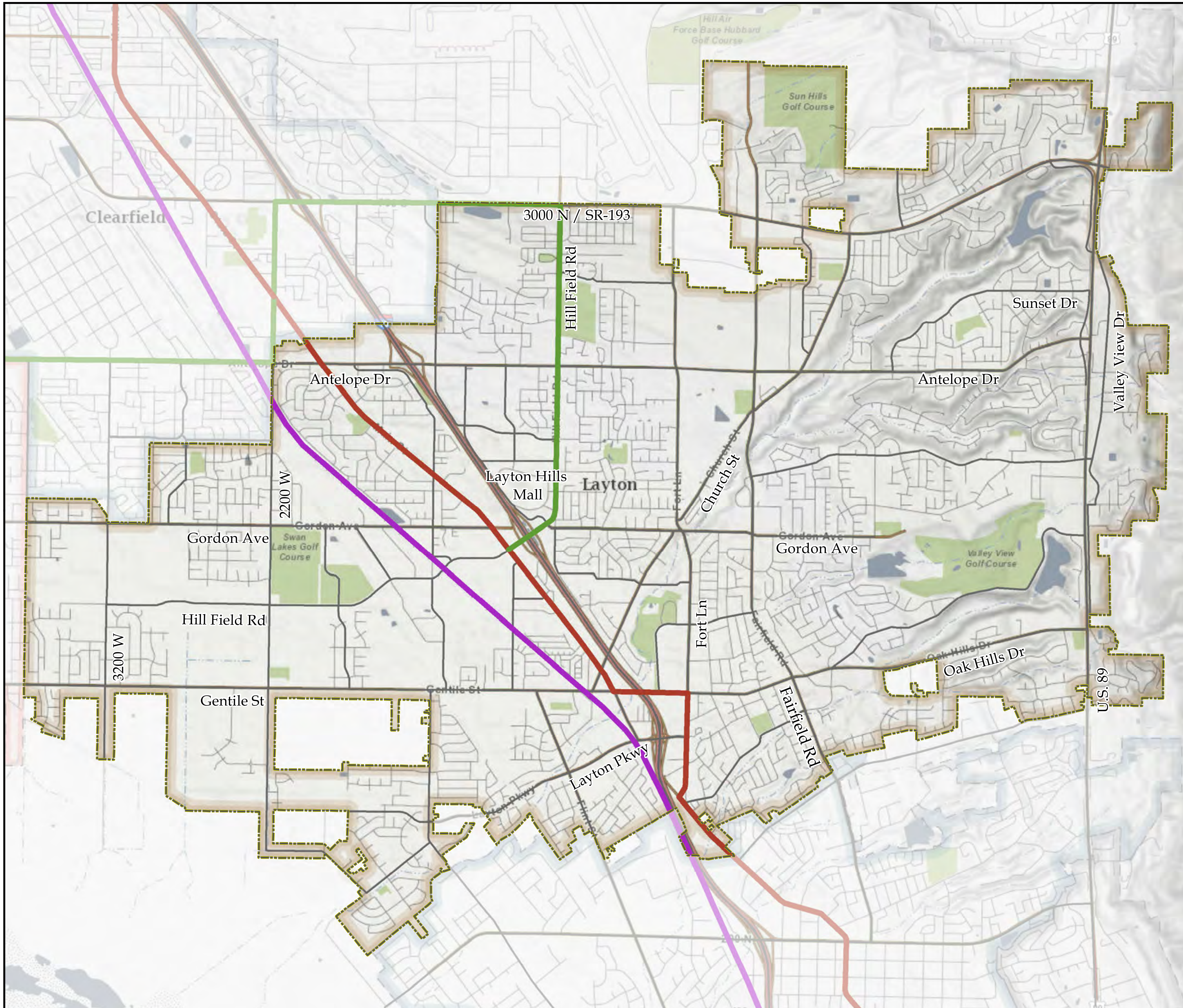
Figure 17: WFRC Long Range Transit Plan



Legend

Layton City Boundary

WFRC 2015-2040 RTP - Transit

Bus Rapid Transit (BRT 3)

Commuter Rail

Enhanced Bus (BRT 1)

N

0 0.5 1 2 Miles

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Transportation Plan Guidelines

School Zone Planning

There are many children using all modes of transportation modes to travel to and from school. Without proper planning, students have a higher risk of injury during their commute. All guidelines for traffic control in school zones are found in Chapter 7 of the Utah MUTCD, which is found online at http://mutcd.fhwa.dot.gov. Included in this chapter are guidelines to creating SNAP plans as well as the process for school crossing control criteria, such as signage, pavement markings, and crossing supervision. Also included in **Appendix G: Utah MUTCD Warrant Flowcharts**, are flow charts for schools to use when warranting school crosswalk zones, reduced speed school zone, an overhead school speed limit assembly, crossing guards, and narrow school routes. It is recommended that Layton City use Chapter 7 of the Utah MUTCD to assure that all school zones are up to code to provide the safest environment for students travelling to school.

Access Management

Access management is a term that refers to providing and managing access to land development while maintaining traffic flow and being attentive to safety issues. It includes elements such as driveway spacing, signal spacing, and corner clearance. Access management is a key element in transportation planning, helping to make transportation corridors operate more efficiently and carry more traffic without costly road widening projects. Access management offers local governments a systematic approach to decision-making applying principles uniformly, equitably, and consistently throughout the jurisdiction.

An access management program must address the balance between access and mobility. While the functional classification of roads implies the priority of access versus mobility, access management does much the same thing. Freeways move vehicles over long distances at high speeds with very controlled access and great mobility. Conversely, residential streets offer high levels of access but at low speeds and with little mobility. Access management standards must account for these different functions of various facilities. The access management standards followed by the city are based on the FHWA access guide and are outlined in detail in the Layton City Road and Bridge Standards.

Principles of Access Management

Constantly growing traffic congestion, concerns over traffic safety, and the ever increasing cost of upgrading roads have generated interest in managing the access to not only the highway system, but to surface streets as well. Access management is the process that provides access to land development while simultaneously preserving the flow of traffic on the surrounding road system in terms of safety, capacity, and speed. Access management attempts to balance the need to provide good mobility for through traffic with the requirements for reasonable access to adjacent land uses.

Arguably the most important concept in understanding the need for access management is to insure the movement of traffic and access to property is mutually exclusive (See **Figure 5: Mobility vs. Access Chart**). No facility can move traffic very well and provide unlimited access at the same time. The extreme examples of this concept are the freeways and the cul-de-sac. The freeway moves traffic very well with few opportunities for access, while the cul-de-sac has unlimited opportunities for access, but doesn't move traffic very well. In many cases, accidents and congestion are the result of streets trying to serve both mobility and access at the same time.

A good access management program will accomplish the following:

- Limit the number of conflict points at driveway locations.
- Separate conflict areas.
- Reduce the interference of through traffic.
- Provide sufficient spacing for at-grade, signalized intersections.
- Provide adequate on-site circulation and storage.

Access management attempts to put an end to the seemingly endless cycle of road improvements followed by increased access, increased congestion, and the need for more road improvements.

Poor planning and inadequate control of access can quickly lead to an unnecessarily high number of direct accesses along roadways. The movements that occur on and off roadways at driveway locations, when those driveways are too closely spaced, can make it very difficult for through traffic to flow smoothly at desired speeds and levels of safety. The American Association of State Highway and Transportation Officials (AASHTO) states, "the number of accidents is disproportionately higher at driveways than at other intersections…thus their design and location merits special consideration." Studies have shown that anywhere between 50 and 70 percent of all crashes that occur on the urban street system are access related.

Fewer direct access, greater separation of driveways, and better driveway design and location are the basic elements of access management. There is less occasion for through traffic to brake and change lanes in order to avoid turning traffic when these techniques are implemented uniformly and comprehensively.

Consequently, with good access management, the flow of traffic will be smoother and average travel speeds higher. There will definitely be less potential for accidents. According to the Federal Highway Administration (FHWA), before and after analyses show that routes with well managed access can experience 50 percent fewer accidents than comparable facilities with no access controls.

Intelligent Transportation Systems

Intelligent Transportation Systems (ITS) refers to the increased use of technology and communication methods to improve traffic operations. Pavement detectors, traffic cameras and weather sensors are used to gather constant information about traffic flow conditions along corridors or at intersections. This information may be relayed to a traffic control center where operators can change traffic signal timing plans or post messages on variable message signs. All of the traffic signals located on Arterial streets in

Layton City are connected to the UDOT and Davis County Traffic Operations Center by the use of fiber optic cable or radio antennas.

Traffic Signal Coordination

Traffic signal coordination is another ITS method that is used to improve traffic operations and efficiency. Traffic signal timing and phasing improvements generally improve all traffic flow but can also be used to favor high-occupancy vehicles or buses. Some ways in which signal timing can be used to favor transit include transit pre-emption and priority. Transit pre-emption means that as a transit vehicle approaches an intersection the signal timing is interrupted to accommodate the transit vehicle. This interrupts the signal coordination of a corridor or network and as such is generally not recommended. Transit priority allows traffic signals to adjust their phasing to give priority to transit vehicles without interrupting the overall traffic signal timing plan.

Connectivity

Layton City desires a connected street system for all new developments, minimizing the use of cul-de-sacs. Infill parcels will be required to provide future street stubs to adjacent parcels with the potential for development. Retail and office development must provide cross access easements to create circulation patterns to adjacent properties, to eliminate multiple access points to the major street system. Consequently, this will reduce travel time and congestion by allowing drivers to make shorter and more direct trips. In addition, connectivity will allow the option of walking or bicycling, due to shorter routes to schools, parks and businesses. Emergency vehicles including police, fire trucks, and ambulances will similarly benefit from connectivity, by use of alternate routes if one is blocked. Overall fuel consumption and pollution will also result by shortening trips through connectivity.

Safety

One of the main goals of the Transportation Element of the General Plan and long term transportation planning in general is to estimate traffic growth and provide for adequate facilities as the need arises. The safe traffic operations of these future facilities are of equal importance. As a result, all of these facilities should be constructed and maintained to applicable design and engineering standards such as those set forth in Layton City ordinances, AASHTO “Policy on Geometric Design of Highways and Streets,” and the Manual on Uniform Traffic Control Devices (MUTCD). This includes implementing applicable Americans with Disabilities Act (ADA) standards and school zone treatments.

Americans with Disabilities Act (ADA)

The Americans with Disabilities Act of 1990 prohibits discrimination and ensures equal opportunity and access for persons with disabilities.

ADA standards govern the construction and alteration of places of public accommodation, commercial facilities, and state and local government facilities. The Department of Justice (DOJ) maintains ADA standards that apply to all ADA facilities except transit facilities, which are subject to similar standards issued by the Department of Transportation (DOT). The DOJ published revised regulations for Titles II and III of the American with Disabilities Act of 1990 in the Federal Register on September 15, 2010, which are available online at http://www.ada.gov/2010ADAstandards_index.htm. In the DOJ, Chapter 4: Accessible Routes of the 2010 ADA Standards for Titles II and II Facilities governs the design of accessible routes.

The ADA standards should be regularly reviewed to ensure that City standards and specifications are in compliance with Federal ADA regulations. All areas of newly designed and newly constructed buildings and facilities and altered portions of existing buildings and facilities shall comply with the ADA requirements as published. Although only new and altered facilities must be in compliance with ADA standards, in order to improve the quality of life for Layton City residents with disabilities, a thorough review of all public right-of-ways and facilities should be conducted over the next few years, as far as is economically viable.

The City Public Works Department will budget funds for survey, inventory and reconstruction of existing facilities to identify areas of non-compliance. Layton City intends to inventory the City facilities that are eligible for ADA compliance over the next two years. These facilities will be stored within a Geographic Information Systems (GIS) database and areas of ADA deficiency will be cataloged. Once a database has been established, a plan will be set in motion to budget for improving facilities that may be readily approved in compliance with the 2010 ADA standards. Priority will be given to sensitive facilities such as the senior center, schools, senior care centers and medical centers. In addition, the City will prioritize public facilities over private or residential areas. Some areas where compliance issues will be addressed through priority include ramps at pedestrian crossings, missing sidewalks and deficient sidewalk widths.

Traffic Calming Program

ITE has established a definition for traffic calming that reads, *"Traffic calming is the combination of mainly physical measures that reduce the negative effects of motor vehicle use, alter driver behavior and improve conditions for non-motorized street users."* Altering driver behavior includes lowering of speeds, reducing aggressive driving, and increasing respect for non-motorized street users.

Traffic calming provides many benefits to pedestrians and to the creation of livable neighborhoods. Traffic calming and slower traffic enhances pedestrian safety by:

- *Decreasing the chances of a car-pedestrian collision*
- *Reducing the severity of injuries should a collision occur*
- *Making it easier and less intimidating for pedestrians to cross streets*

Traffic calming and slower traffic encourage more walking and bicycling by improving the ambiance of the neighborhood and more livable streets by:

- *Producing less traffic noise*
- *Reducing the level of air pollution*

Street patterns are typically developed at the time of construction. In Utah, the history of using a grid system for planning and development purposes started with the first settlers and has proven efficient for moving people and goods throughout a network of surface streets. However, the nature of a grid system with wide and often long, straight roads can result in excessive speeds. For that reason, traffic calming measures (TCM) can be implemented to reduce speeds on residential roadways. Traffic calming is, however, still applicable to many neighborhood or local streets and may be given consideration on the

City's local and residential streets on a case-by-case basis upon request. More information is included in **Appendix H: Traffic Calming Program** where specific guidelines as well as a Traffic Calming Toolbox are included.

Corridor Preservation

Corridor preservation is an important transportation planning tool that agencies should use and apply to all future transportation corridors. There are several new transportation facilities that have been identified in the Transportation Master Plan. In planning for these future facilities, corridor preservation techniques should be employed. The main purposes of corridor preservation are to:

- Preserve the viability of future options
- Reduce the cost of these options
- Minimize environmental and socio-economic impacts of future implementation

Corridor preservation seeks to preserve the right-of-way needed for future transportation facilities and prevent development that might be incompatible with these facilities. This is primarily accomplished by the community's ability to apply land use controls, such as zoning and approval of developments. Adoption of the Transportation Master Plan by Layton City is a commitment to citizens and future leaders in the community that the identified future corridors will be the ultimate location for transportation facilities.

Perhaps the most important elements of corridor preservation are ensuring that the corridors are preserved in the correct location and that they meet the applicable design and right-of-way standards for the type of facility being preserved. As the master plan does not define the exact alignment of each future corridor, it becomes the responsibility of the City to make sure the corridors are correctly preserved. This will have to be accomplished through the engineering and planning reviews done within the City as development and annexation requests are approved that involve properties within or adjacent to the future corridors.

Corridor Preservation Techniques

Some examples of specific corridor preservation techniques that may be most beneficial and easily implemented include the following:

- **Developer Incentives and Agreements**: Public agencies can offer incentives in the form of tax abatements, density credits, or timely site plan approvals to developers who maintain property within proposed transportation corridors in an undeveloped state.
- **Exactions:** As development proposals are submitted to the city for review, efforts should be made to exact land identified within the future corridors.
- **Fee Simple Acquisitions**: A voluntary transaction full ownership of a land parcel, including the underlying title, transferred from the owner to the City via either purchase or donation.
- **Transfer of Development Rights and Density Transfers**: Government entities can provide incentives for developers and landowners to participate in corridor preservation programs using

the transfer of development rights and density transfers. This is a powerful tool in that there seldom is any capital cost to local governments.

- **Land Use Controls**: This method allows government entities to use its policing power to regulate intensity and types of land use. Zoning ordinances are the primary controls over land use and the most important land use tools available for use in corridor preservation programs.
- **Purchase of Options and Easements**: Options and easements allow government agencies to purchase interests in property that lies within highway corridors without obtaining full title of the land.
- **Annexation**: The City of Layton has adopted the policy of requiring the right-of-way for roadways to be dedicated to the City during the annexation process. This becomes part of the annexation agreement and is an effective and efficient way to procure needed right-of-way for future expansion.

Traffic Impact Studies

As growth occurs throughout the City, the City will evaluate the impacts of proposed developments on the surrounding transportation networks prior to giving approval to build. This will be accomplished by requiring that a Traffic Impact Study (TIS) be performed for any development in the City based on city staff recommendations. A TIS will allow the City to determine the site specific impacts of a development including internal site circulation, access issues, and adjacent roadway and intersection impacts. In addition, a TIS will assist in defining possible impacts to the overall transportation system in the vicinity of the development. The area and items to be evaluated in a TIS include key intersections and roads as determined by the City Traffic Engineer on a case by case basis.

Each TIS will be conducted by a qualified Traffic Engineer chosen by the developer at their cost and approved by the City. A scope meeting will be required by the developer/Traffic Engineer with the City Engineer to determine the scope of each TIS. Layton Traffic Impact Study Requirements are included in **Appendix I: Traffic Impact Study Requirements** of this report.

Appendix A: Intersection Analysis

Layton Intersection Analysis Summary

Intersection	Existing LOS	2040 No Build LOS	Recommended Improvement	Improved LOS
Antelope Drive & Robins Way	54s – D	49s – D	Dual SBL	29s – C
Antelope Drive & 700 W	19s – B	14s – B	None	14s – B
Antelope Drive & Hill Field Road	42s – D	76s – E	Dual EBL & WBL turn lanes; exclusive WBR turn lane; exclusive NBR turn lane w/ turn arrow	52s – D
Antelope Drive & Church Street	14s – B	84s – F	Roundabout with channelized WBR	33s – D
Fairfield Road & Church Street	20s – C	32s – D	Install traffic signal to improve safety	15s – B
Church Street & Gordon Avenue	15s – B	35s – D	None	35s – D
Fort Lane & Gordon Avenue	16s – B	18s – B	None	18s – B
Church Street & Fort Lane	16s – B	13s – B	None	13s – B
Main Street & Church Street	30s – D	25s – C	None	25s – C
Angel Street & Gentile Street	25s – C	20s – B	Consider aligning Sugar St w/ Angel St	20s – B
Wasatch Drive & Gentile Street	12s – B	18s – B	Dual EB & WB through lanes; install EB left turn arrow	9s – A
Fort Lane & Gentile Street	42s – D	112s – F	Dual EB & WB through lanes; add NB right turn arrow	36s – C
Fairfield Road & Gentile Street	20s – B	69s – E	Dual EB & WB through lanes; left turn arrows on all legs	32s – C
Oak Hills Drive & Gentile Street	30s – D	>180s – F	Channelize intersection per city's conceptual layout	>180s[1] – F
2700 W & Layton Pkwy	NA	NA	New Intersection (see interchange concept)	13s – B
Weaver Lane & Angel Street	46s – E	>180s – F	Install traffic signal and an exclusive NB left turn lane	10s – B

[1]Delay for NB & SB left and through movements (approx. 55 vehicles in 2040 PM peak hour)

Appendix B: Cost Estimates

Project Summary (All Projects - Full Funding)						
Project	Location	Total Price	Funding Source	Range (Yr)	Layton City %	Layton City Total
1	2700 West: West Hillfield Road to Gentile Street	$4,899,000	Layton	2025	42%	$2,041,000
2	Traffic Signal: 200 South and Main Street	$340,000	Layton	2040	100%	$340,000
3	650 West: Weaver Lane to Gentile St	$3,647,000	Layton	2040	15%	$541,000
4	Layton Parkway: 1700 West to 2700 West	$3,591,000	Layton	2025	29%	$1,039,000
5	Oaks Hill Drive: US-89 to Fairfield Rd.	$8,933,000	UDOT	2040	0%	$0
6	Gentile St.: Main Street (SR-126) to Fairfield Rd	$13,888,000	Layton/WFRC	2025	7%	$973,000
7	Fairfield Road: Gentile Street to Cherry Lane	$274,000	Layton	2040	100%	$274,000
8	Fairfield Road: Cherry Lane to Antelope Drive	$2,439,000	Layton	2040	100%	$2,439,000
9	Antelope Drive: Hill Field Rd. to Oak Forest	$248,000	Layton	2040	100%	$248,000
10	Layton Parkway: Angel (1200 West) to 1700 West	$3,728,000	Layton	2025	29%	$1,079,000
11	Angel Street and Sugar Street Connection	$1,125,000	Layton	2025	100%	$1,125,000
12	1700 West: Gentile St to Layton Pkwy	$5,287,000	Layton	2040	15%	$784,000
13	Layton Parkway: 2700 West to Bluff Ridge Blvd	$6,700,000	Layton	2040	29%	$1,939,000
14	1425 North 1-15 Overpass: Main Street to Hillfield Road	$15,026,000	UDOT	2025	0%	$0
15	Frontage Road: 2000 North to 1450 South	$752,000	Layton	2025	100%	$752,000
16	Frontage Road to US-89: Mutton Hollow Road to 1000 North (West Side)	$3,005,000	UDOT	2025	0%	$0
17	3200 West: Layton Parkway to Gordon	$3,303,000	Layton	2040	100%	$3,303,000
18	Gordon Ave: 1800 East to Highway 89	$8,010,000	Layton	2025	100%	$8,010,000
19	Signal: Wasatch Drive and Fairfield Road	$272,000	Layton	2025	100%	$272,000
20	Roundabout: 2700 West and Layton Parkway	$650,000	Layton	2025	100%	$650,000
21	Eastridge Business Loop: Fairfield Rd (End of Existing) to Church St	$5,863,000	Layton	2040	15%	$869,000
23	Signal: SR-193 and 1700 East	$272,000	UDOT	2025	0%	$0
24	Signal: Fairfield Road and Church Street	$272,000	Layton	2025	100%	$272,000
25	Signal: Gentile Street and 650 West	$272,000	Layton	2025	100%	$272,000
26	Signal: Hill Field Road and Cold Creek Way	$272,000	Layton	2025	100%	$272,000
27	Signal: Gordon Avenue and 3700 West	$272,000	Layton	2040	100%	$272,000
28	Signal: Weaver Lane and Angel Street	$272,000	Layton	2025	100%	$272,000
29	Roundabout: Oak Hills Drive and Gentile Street	$378,000	Layton	2025	100%	$378,000
30	3650 West: Gordon Ave to Gentile Street	$2,877,000	Layton	2025	29%	$835,000
31	Signals: Layton Pkwy at 1700 West & 2200 West	$544,000	Layton	2025	100%	$544,000
32	Signals: Gordon Ave at 1200 West (Angel St) and Cold Creek Way	$544,000	Layton	2025	100%	$544,000
33	Signal Modifications: Gentile Street at Wasach Drive, Fort Lane and Fairfield Road	$816,000	Layton	2025	15%	$123,000
34	Signals: Gordon Ave at Emerald Drive and 2600 East	$544,000	Layton	2025	100%	$544,000
35	Roundabout: Antelope Drive and Church Street	$680,000	Layton	2025	100%	$680,000
36	Roundabout: Antelope Drive and Oak Forest Drive	$200,000	Layton	2025	100%	$200,000
37	Signal: Fairfield Road and Rosewood Lane	$272,000	Layton	2040	100%	$272,000
38	Signal: Main Street and Fort Lane	$272,000	Layton	2040	100%	$272,000
39	Signal: Hill Field Road and 1425 North	$272,000	UDOT	2025	0%	$0
40	Signals: University Park Blvd and 2600 North	$272,000	Layton	2040	100%	$272,000
41	Signal: West Hillfield and Sugar Street	$272,000	Layton	2025	100%	$272,000
42	Signal: Main Street and 1425 Bridge Overpass	$272,000	UDOT	2025	0%	$0
43	Signal: Antelope and Hillfield Road	$272,000	Layton	2025	100%	$272,000
44	Signal: Gentile and Cold Creek Way	$272,000	Layton	2040	100%	$272,000
45	2700 West: Gentile Street to West Davis Corridor	$8,814,000	Layton	2025	42%	$3,671,000
46	Angel Street: Gentile Street to Kaysville Border	$1,742,000	Layton	2025	100%	$1,742,000
47	Hill Field Road: Railroad Crossing	$1,742,000	Layton/WFRC	2040	8%	$2,356,000
48	Hill Field Road: 2200 West to 2700 West	$2,720,000	Layton	2040	42%	$1,133,000
49	US-89 Interchanges	$275,000,000	UDOT	2025	0%	$0
50	West Hillfield Road: 2700 West to 3650 West	$4,365,000	Layton	2040	29%	$1,263,000
51	Signal: 2100 East and Gordon Avenue	$272,000	Layton	2025	100%	$272,000
52	Signal: Herritage Park and Layton Hills Parkway	$272,000	Layton	2025	100%	$272,000
53	Fort Lane: 1500 North to Antelope Drive	$1,200,000	Layton	2040	100%	$1,200,000
	Total	$398,498,000				$45,427,000

Project Summary (10 Years)						
Project	**Location**	**Total Price**	**Funding Source**	**Range (Yr)**	**Layton City %**	**Layton City Total**
1	2700 West: West Hillfield Road to Gentile Street	$4,899,000	Layton	2025	42%	$2,041,000
4	Layton Parkway: 1700 West to 2700 West	$3,591,000	Layton	2025	29%	$1,039,000
6	Gentile St.: Main Street (SR-126) to Fairfield Rd	$13,888,000	Layton/WFRC	2025	7%	$973,000
10	Layton Parkway: Angel (1200 West) to 1700 West	$3,728,000	Layton	2025	29%	$1,079,000
11	Angel Street and Sugar Street Connection	$1,125,000	Layton	2025	100%	$1,125,000
14	1425 North 1-15 Overpass: Main Street to Hillfield Road	$15,026,000	UDOT	2025	0%	$0
15	Frontage Road: 2000 North to 1450 South	$752,000	Layton	2025	100%	$752,000
16	Frontage Road to US-89: Mutton Hollow Road to 1000 North (West Side)	$3,005,000	UDOT	2025	0%	$0
18	Gordon Ave: 1800 East to Highway 89	$8,010,000	Layton	2025	100%	$8,010,000
19	Signal: Wasatch Drive and Fairfield Road	$272,000	Layton	2025	100%	$272,000
20	Roundabout: 2700 West and Layton Parkway	$650,000	Layton	2025	100%	$650,000
23	Signal: SR-193 and 1700 East	$272,000	UDOT	2025	0%	$0
24	Signal: Fairfield Road and Church Street	$272,000	Layton	2025	100%	$272,000
25	Signal: Gentile Street and 650 West	$272,000	Layton	2025	100%	$272,000
26	Signal: Hill Field Road and Cold Creek Way	$272,000	Layton	2025	100%	$272,000
28	Signal: Weaver Lane and Angel Street	$272,000	Layton	2025	100%	$272,000
29	Roundabout: Oak Hills Drive and Gentile Street	$378,000	Layton	2025	100%	$378,000
30	3650 West: Gordon Ave to Gentile Street	$2,877,000	Layton	2025	29%	$835,000
31	Signals: Layton Pkwy at 1700 West & 2200 West	$544,000	Layton	2025	100%	$544,000
32	Signals: Gordon Ave at 1200 West (Angel St) and Cold Creek Way	$544,000	Layton	2025	100%	$544,000
33	Signal Modifications: Gentile Street at Wasach Drive, Fort Lane and Fairfield Road	$816,000	Layton	2025	15%	$123,000
34	Signals: Gordon Ave at Emerald Drive and 2600 East	$544,000	Layton	2025	100%	$544,000
35	Roundabout: Antelope Drive and Church Street	$680,000	Layton	2025	100%	$680,000
36	Roundabout: Antelope Drive and Oak Forest Drive	$200,000	Layton	2025	100%	$200,000
39	Signal: Hill Field Road and 1425 North	$272,000	UDOT	2025	0%	$0
41	Signal: West Hillfield and Sugar Street	$272,000	Layton	2025	100%	$272,000
42	Signal: Main Street and 1425 Bridge Overpass	$272,000	UDOT	2025	0%	$0
43	Signal: Antelope and Hillfield Road	$272,000	Layton	2025	100%	$272,000
45	2700 West: Gentile Street to West Davis Corridor	$8,814,000	Layton	2025	42%	$3,671,000
46	Angel Street: Gentile Street to Kaysville Border	$1,742,000	Layton	2025	100%	$1,742,000
49	US-89 Interchanges	$275,000,000	UDOT	2025	0%	$0
51	Signal: 2100 East and Gordon Avenue	$272,000	Layton	2025	100%	$272,000
52	Signal: Herritage Park and Layton Hills Parkway	$272,000	Layton	2025	100%	$272,000
	Total	**$350,077,000**				**$27,378,000**

Layton City

Transportation Improvement Program (TIP)

Unit Costs

Item	Unit	Unit Cost
Parkstrip	S.F.	$10.00
Removal of Existing Asphalt	S.Y.	$4.00
Clearing and Grubbing	Acre	$2,000.00
Roadway Excavation	C.Y.	$10.50
HMA Concrete	Ton	$85.00
Untreated Base Course	C.Y.	$15.00
Granular Borrow	C.Y.	$40.00
Curb and Gutter (2.5' width)	L.F.	$22.50
Sidewalk (4' width)	L.F.	$25.00
Drainage	L.F.	$45.00
Right of Way	S.F.	$4.00
Signage Striping	L.F.	$1.00
Bridge/Culvert	S.F.	$225.00
Traffic Signal	Each	$180,000

Contingency	25%

Mobilization	10%

Preconstruction Engineering	8%
Construction Engineering	8%

Layton City TMP

Developer's Responsibility vs. City's Responsibility

			100' Length of Minor Street (50' Cross-Section)		100' Length of Minor Collector (60' Cross-Section)		100' Length of Collector (66' Cross-Section)		100' Length of Minor Arterial (84' Cross-Section)		100' Length of Arterial (100' Cross-Section)		100' Length of Principal Arterial (124' Cross-Section)	
Item	**Unit**	**Unit Cost**	**Quantity**	**Cost**	**Quantity**	**Cost**	**Quantity**	**Cost**	**Quantity**	**Cost**	**Quantity**	**Cost**	**Quantity**	**Cost**
Parkstrip	S.F.	$10	900	$9,000	900	$9,000	900	$9,000	900	$9,000	900	$9,000	900	$9,000
Removal of Existing Asphalt	S.Y.	$4	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
Clearing and Grubbing	Acre	$2,000	0.11	$230	0.14	$275	0.15	$303	0.19	$386	0.23	$459	0.28	$569
Roadway Excavation	C.Y.	$11	112	$1,176	139	$1,462	160	$1,676	481	$5,056	650	$6,826	843	$8,849
HMA Concrete	Ton	$85	64	$5,435	79	$6,752	121	$10,320	168	$14,273	314	$26,679	407	$34,584
Untreated Base Course	C.Y.	$15	81	$1,222	101	$1,519	116	$1,741	160	$2,407	200	$3,000	259	$3,889
Granular Borrow	C.Y.	$40	0	$0	0	$0	174	$6,963	241	$9,630	300	$12,000	389	$15,556
Curb and Gutter (2.5' width)	L.F.	$23	200	$4,500	200	$4,500	200	$4,500	200	$4,500	200	$4,500	200	$4,500
Sidewalk (4' width)	L.F.	$25	800	$20,000	1000	$25,000	1000	$25,000	1000	$25,000	1000	$25,000	1000	$25,000
Drainage	L.F.	$45	100	$4,500	100	$4,500	100	$4,500	100	$4,500	100	$4,500	100	$4,500
Right of Way	S.F.	$4	5000	$20,000	6000	$24,000	6600	$26,400	8400	$33,600	10000	$40,000	12400	$49,600
Signage Striping	L.F.	$1	-	-	-	-	-	-	-	-	-	-	-	-
Bridge/Culvert	S.F.	$225	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
Traffic Signal	Each	$180,000	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
Subtotal				$66,063		$77,008		$90,403		$108,351		$131,965		$156,047
Contingency			25%	$16,516		$19,252		$22,601		$27,088		$32,991		$39,012
Mobilization			10%	$6,606		$7,701		$9,040		$10,835		$13,196		$15,605
Preconstruction Engineering			8%	$5,285		$6,161		$7,232		$8,668		$10,557		$12,484
Construction Engineering			8%	$5,285		$6,161		$7,232		$8,668		$10,557		$12,484
Total Project Cost				$99,755		$116,282		$136,508		$163,610		$199,266		$235,631
Developers Responsibility			100%	$99,755	100%	$116,282	85%	$116,282	71%	$116,282	58%	$116,282	49%	$116,282
Layton City's Responsibility			0%	$0	0%	$0	15%	$20,226	29%	$47,328	42%	$82,985	51%	$119,349
Overall Assumptions:														
HMA Pavement Density (pcf) =				155		155		155		155		155		155
HMA Thickness (in) =				3		3		4		4		6		6
Untreated Base Course Thickness (in) =				8		8		8		8		8		8
Granual Borrow Thickness (in) =				0		0		12		12		12		12
Roadway Excavation Depth (ft) =				0.9167		0.9167		2		2		2.167		2.167
Number of Sidewalks (No.) =				2		2		2		2		2		2

Layton City
Transportation Master Plan

Oaks Hill Drive: US-89 to Fairfield Rd.

Arterial

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10	87,300	$873,000
Removal of Existing Asphalt	S.Y.	$4	51,733	$206,933
Clearing and Grubbing	Acre	$2,000	8	$16,033
Roadway Excavation	C.Y.	$11	21,798	$228,883
HMA Concrete	Ton	$85	10,525	$894,583
Untreated Base Course	C.Y.	$15	6,706	$100,593
Granular Borrow	C.Y.	$40	10,059	$402,370
Curb and Gutter (2.5' width)	L.F.	$23	19,400	$436,500
Sidewalk (4' width)	L.F.	$25	19,400	$485,000
Drainage	L.F.	$45	19,400	$873,000
Right of Way	S.F.	$4	349,200	$1,396,800
Signage Striping	L.F.	$1	2,005	$2,005
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	0	$0
			Subtotal	**$5,915,700**

Contingency	25%	$1,478,925
Mobilization	10%	$591,570
Preconstruction Engineering	8%	$473,256
Construction Engineering	8%	$473,256
Total Project Costs		**$8,933,000**

Layton City's Responsibility	**0%**
	$0

<u>Overall Assumptions:</u>

HMA Pavement Density (pcf) =	155	Project No.	**5**
HMA Thickness (in) =	6	Funding:	**UDOT**
Untreated Base Course Thickness (in) =	8	Type:	**New**
Granual Borrow Thickness (in) =	12		
Roadway Excavation Depth (ft) =	2.167		
Number of Sidewalks (No.) =	2		

Layton City
Transportation Master Plan

Gentile St.: Main Street (SR-126) to Fairfield Rd

Arterial

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10	53,100	$531,000
Removal of Existing Asphalt	S.Y.	$4	31,467	$125,867
Clearing and Grubbing	Acre	$2,000	5	$9,752
Roadway Excavation	C.Y.	$11	13,259	$139,218
HMA Concrete	Ton	$85	6,402	$544,128
Untreated Base Course	C.Y.	$15	4,079	$61,185
Granular Borrow	C.Y.	$40	6,119	$244,741
Curb and Gutter (2.5' width)	L.F.	$23	11,800	$265,500
Sidewalk (4' width)	L.F.	$25	11,800	$295,000
Drainage	L.F.	$45	11,800	$531,000
Right of Way	S.F.	$4	212,400	$849,600
Homes	Each	$200,000	28	$5,600,000
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	0	$0
			Subtotal	**$9,196,990**

Contingency	25%	$2,299,247
Mobilization	10%	$919,699
Preconstruction Engineering	8%	$735,759
Construction Engineering	8%	$735,759
Total Project Costs		**$13,888,000**

Layton City's Responsibility	**7%**
	$973,000

Overall Assumptions:

HMA Pavement Density (pcf) =	155
HMA Thickness (in) =	6
Untreated Base Course Thickness (in) =	8
Granual Borrow Thickness (in) =	12
Roadway Excavation Depth (ft) =	2.167
Number of Sidewalks (No.) =	2

Project No.	**6**
Funding:	Layton/WFRC
Type:	**New**

Layton City
Transportation Master Plan

1425 North 1-15 Overpass: Main Street to Hillfield Road

Minor Collector

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10	270,014	$2,700,144
Removal of Existing Asphalt	S.Y.	$4	120,006	$480,026
Clearing and Grubbing	Acre	$2,000	7	$13,775
Roadway Excavation	C.Y.	$11	0	$0
HMA Concrete	Ton	$85	0	$0
Untreated Base Course	C.Y.	$15	0	$0
Granular Borrow	C.Y.	$40	0	$0
Curb and Gutter (2.5' width)	L.F.	$23	60,003	$1,350,072
Sidewalk (4' width)	L.F.	$25	60,003	$1,500,080
Drainage	L.F.	$45	60,003	$2,700,144
Right of Way	S.F.	$4	300,016	$1,200,064
Signage Striping	L.F.	$1	6,200	$6,200
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	0	$0
			Subtotal	**$9,950,505**

Contingency	25%	$2,487,626
Mobilization	10%	$995,051
Preconstruction Engineering	8%	$796,040
Construction Engineering	8%	$796,040
Total Project Costs		**$15,026,000**

Layton City's Responsibility	**0%**
	$0

Overall Assumptions:

HMA Pavement Density (pcf) =	155	Project No.	**14**
HMA Thickness (in) =	3	Funding:	**UDOT**
Untreated Base Course Thickness (in) =	8	Type:	**New**
Granular Borrow Thickness (in) =	0		
Roadway Excavation Depth (ft) =	0.9167		
Number of Sidewalks (No.) =	2		

Layton City Transportation Master Plan				
Frontage Road to US-89: Mutton Hollow Road to 1000 North (West Side) Minor Collector				
Costs				
Item	**Unit**	**Unit Cost**	**Quantity**	**Cost**
Parkstrip	S.F.	$10	54,000	$540,000
Removal of Existing Asphalt	S.Y.	$4	24,000	$96,000
Clearing and Grubbing	Acre	$2,000	1	$2,755
Roadway Excavation	C.Y.	$11	0	$0
HMA Concrete	Ton	$85	0	$0
Untreated Base Course	C.Y.	$15	0	$0
Granular Borrow	C.Y.	$40	0	$0
Curb and Gutter (2.5' width)	L.F.	$23	12,000	$270,000
Sidewalk (4' width)	L.F.	$25	12,000	$300,000
Drainage	L.F.	$45	12,000	$540,000
Right of Way	S.F.	$4	60,000	$240,000
Signage Striping	L.F.	$1	1,240	$1,240
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	0	$0
			Subtotal	**$1,989,995**
		Contingency	25%	$497,499
		Mobilization	10%	$198,999
		Preconstruction Engineering	8%	$159,200
		Construction Engineering	8%	$159,200
			Total Project Costs	**$3,005,000**
			Layton City's Responsibility	**0%** **$0**

Overall Assumptions:

HMA Pavement Density (pcf) =	155	Project No.	**16**
HMA Thickness (in) =	3	Funding:	**UDOT**
Untreated Base Course Thickness (in) =	8	Type:	**New**
Granual Borrow Thickness (in) =	0		
Roadway Excavation Depth (ft) =	0.9167		
Number of Sidewalks (No.) =	2		

Layton City
Transportation Master Plan

Frontage to US-89: 1000 North to 1925 North (East Side)

Minor Collector

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10	45,000	$450,000
Removal of Existing Asphalt	S.Y.	$4	0	$0
Clearing and Grubbing	Acre	$2,000	7	$13,774
Roadway Excavation	C.Y.	$11	6,111	$64,169
HMA Concrete	Ton	$85	3,488	$296,438
Untreated Base Course	C.Y.	$15	4,444	$66,667
Granular Borrow	C.Y.	$40	0	$0
Curb and Gutter (2.5' width)	L.F.	$23	10,000	$225,000
Sidewalk (4' width)	L.F.	$25	10,000	$250,000
Drainage	L.F.	$45	10,000	$450,000
Right of Way	S.F.	$4	300,000	$1,200,000
Signage Striping	L.F.	$1	1,033	$1,033
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	0	$0
			Subtotal	**$3,017,081**

Contingency	25%	$754,270
Mobilization	10%	$301,708
Preconstruction Engineering	8%	$241,366
Construction Engineering	8%	$241,366
Total Project Costs		**$4,556,000**

Layton City's Responsibility	**0%**
	$0

Overall Assumptions:

HMA Pavement Density (pcf) =	155	Project No.	**22**
HMA Thickness (in) =	3	Funding:	**UDOT**
Untreated Base Course Thickness (in) =	8	Type:	**New**
Granual Borrow Thickness (in) =	0		
Roadway Excavation Depth (ft) =	0.9167		
Number of Sidewalks (No.) =	2		

Layton City Transportation Master Plan				
Signal: SR-193 and 1700 East				
Arterial				
Costs				
Item	**Unit**	**Unit Cost**	**Quantity**	**Cost**
Parkstrip	S.F.	$10	0	$0
Removal of Existing Asphalt	S.Y.	$4	0	$0
Clearing and Grubbing	Acre	$2,000	0	$0
Roadway Excavation	C.Y.	$11	0	$0
HMA Concrete	Ton	$85	0	$0
Untreated Base Course	C.Y.	$15	0	$0
Granular Borrow	C.Y.	$40	0	$0
Curb and Gutter (2.5' width)	L.F.	$23	0	$0
Sidewalk (4' width)	L.F.	$25	0	$0
Drainage	L.F.	$45	0	$0
Right of Way	S.F.	$4	0	$0
Signage Striping	L.F.	$1	0	$0
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	1	$180,000
			Subtotal	**$180,000**

Contingency	25%	$45,000
Mobilization	10%	$18,000
Preconstruction Engineering	8%	$14,400
Construction Engineering	8%	$14,400
Total Project Costs		**$272,000**

Layton City's Responsibility	**0%**
	$0

Overall Assumptions:

HMA Pavement Density (pcf) =	155	Project No.	**23**
HMA Thickness (in) =	6	Funding:	**UDOT**
Untreated Base Course Thickness (in) =	8	Type:	**Signal**
Granular Borrow Thickness (in) =	12		
Roadway Excavation Depth (ft) =	2.167		
Number of Sidewalks (No.) =	2		

Layton City
Transportation Master Plan

Signal: Hill Field Road and 1425 North

Arterial

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10	0	$0
Removal of Existing Asphalt	S.Y.	$4	0	$0
Clearing and Grubbing	Acre	$2,000	0	$0
Roadway Excavation	C.Y.	$11	0	$0
HMA Concrete	Ton	$85	0	$0
Untreated Base Course	C.Y.	$15	0	$0
Granular Borrow	C.Y.	$40	0	$0
Curb and Gutter (2.5' width)	L.F.	$23	0	$0
Sidewalk (4' width)	L.F.	$25	0	$0
Drainage	L.F.	$45	0	$0
Right of Way	S.F.	$4	0	$0
Signage Striping	L.F.	$1	0	$0
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	1	$180,000
			Subtotal	**$180,000**

Contingency	25%	$45,000
Mobilization	10%	$18,000
Preconstruction Engineering	8%	$14,400
Construction Engineering	8%	$14,400

Total Project Costs	**$272,000**

Layton City's Responsibility	**0%**
	$0

Overall Assumptions:

HMA Pavement Density (pcf) =	155	Project No.	**39**
HMA Thickness (in) =	6	Funding:	**UDOT**
Untreated Base Course Thickness (in) =	8	Type:	**Signal**
Granual Borrow Thickness (in) =	12		
Roadway Excavation Depth (ft) =	2.167		
Number of Sidewalks (No.) =	2		

Layton City
Transportation Master Plan

Signal: Main Street and 1425 Bridge Overpass

Arterial

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10	0	$0
Removal of Existing Asphalt	S.Y.	$4	0	$0
Clearing and Grubbing	Acre	$2,000	0	$0
Roadway Excavation	C.Y.	$11	0	$0
HMA Concrete	Ton	$85	0	$0
Untreated Base Course	C.Y.	$15	0	$0
Granular Borrow	C.Y.	$40	0	$0
Curb and Gutter (2.5' width)	L.F.	$23	0	$0
Sidewalk (4' width)	L.F.	$25	0	$0
Drainage	L.F.	$45	0	$0
Right of Way	S.F.	$4	0	$0
Signage Striping	L.F.	$1	0	$0
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	1	$180,000
			Subtotal	**$180,000**

Contingency	25%	$45,000
Mobilization	10%	$18,000
Preconstruction Engineering	8%	$14,400
Construction Engineering	8%	$14,400
Total Project Costs		**$272,000**

Layton City's Responsibility	**0%**
	$0

Overall Assumptions:

HMA Pavement Density (pcf) =	155	Project No.	**42**
HMA Thickness (in) =	6	Funding:	**UDOT**
Untreated Base Course Thickness (in) =	8	Type:	**Signal**
Granular Borrow Thickness (in) =	12		
Roadway Excavation Depth (ft) =	2.167		
Number of Sidewalks (No.) =	2		

Layton City
Transportation Master Plan

US-89 Interchanges

Arterial

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10	0	$0
Removal of Existing Asphalt	S.Y.	$4	0	$0
Clearing and Grubbing	Acre	$2,000	0	$0
Roadway Excavation	C.Y.	$11	0	$0
HMA Concrete	Ton	$85	0	$0
Untreated Base Course	C.Y.	$15	0	$0
Granular Borrow	C.Y.	$40	0	$0
Curb and Gutter (2.5' width)	L.F.	$23	0	$0
Sidewalk (4' width)	L.F.	$25	0	$0
Drainage	L.F.	$45	0	$0
Right of Way	S.F.	$4	0	$0
Signage Striping	L.F.	$1	21	$21
Bridge/Culvert	S.F.	$225	809,418	$182,119,145
Traffic Signal	Each	$180,000	0	$0
			Subtotal	**$182,119,166**

Contingency	25%	$45,529,792
Mobilization	10%	$18,211,917
Preconstruction Engineering	8%	$14,569,533
Construction Engineering	8%	$14,569,533

Total Project Costs	**$275,000,000**

Layton City's Responsibility	**0%**
	$0

Overall Assumptions:

HMA Pavement Density (pcf) =	155	Project No.	**49**
HMA Thickness (in) =	6	Funding:	**UDOT**
Untreated Base Course Thickness (in) =	8	Type:	**Interchange**
Granular Borrow Thickness (in) =	12		
Roadway Excavation Depth (ft) =	2.167		
Number of Sidewalks (No.) =	2		

Layton City Transportation Master Plan				
2700 West: West Hillfield Road to Gentile Street				
Arterial				
Costs				
Item	**Unit**	**Unit Cost**	**Quantity**	**Cost**
Parkstrip	S.F.	$10	24,300	$243,000
Removal of Existing Asphalt	S.Y.	$4	0	$0
Clearing and Grubbing	Acre	$2,000	6	$12,397
Roadway Excavation	C.Y.	$11	16,469	$172,927
HMA Concrete	Ton	$85	7,952	$675,878
Untreated Base Course	C.Y.	$15	5,067	$76,000
Granular Borrow	C.Y.	$40	7,600	$304,000
Curb and Gutter (2.5' width)	L.F.	$23	5,400	$121,500
Sidewalk (4' width)	L.F.	$25	5,400	$135,000
Drainage	L.F.	$45	5,400	$243,000
Right of Way	S.F.	$4	270,000	$1,080,000
Signage Striping	L.F.	$1	558	$558
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	1	$180,000
			Subtotal	**$3,244,259**

Contingency	25%	$811,065
Mobilization	10%	$324,426
Preconstruction Engineering	8%	$259,541
Construction Engineering	8%	$259,541
Total Project Costs		**$4,899,000**
Layton City's Responsibility	**42%**	**$2,041,000**

<u>Overall Assumptions:</u>

HMA Pavement Density (pcf) =	155	Project No.	**1**
HMA Thickness (in) =	6	Funding:	**Layton**
Untreated Base Course Thickness (in) =	8	Type:	**New**
Granual Borrow Thickness (in) =	12		
Roadway Excavation Depth (ft) =	2.167		
Number of Sidewalks (No.) =	2		

Layton City
Transportation Master Plan

Traffic Signal: 200 South and Main Street

Minor Arterial

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10	0	$0
Removal of Existing Asphalt	S.Y.	$4	0	$0
Clearing and Grubbing	Acre	$2,000	0	$0
Roadway Excavation	C.Y.	$11	0	$0
HMA Concrete	Ton	$85	0	$0
Untreated Base Course	C.Y.	$15	0	$0
Granular Borrow	C.Y.	$40	0	$0
Curb and Gutter (2.5' width)	L.F.	$23	0	$0
Sidewalk (4' width)	L.F.	$30	0	$0
Drainage	L.F.	$45	0	$0
Right of Way	S.F.	$4	0	$0
Actual Construction	LS	$340,000	1	$340,000
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	0	$0
			Subtotal	**$340,000**

Contingency	0%	$0
Mobilization	0%	$0
Preconstruction Engineering	0%	$0
Construction Engineering	0%	$0
Total Project Costs		**$340,000**

Layton City's Responsibility	**100%**
	$340,000

<u>Overall Assumptions:</u>

HMA Pavement Density (pcf) =	155	Project No.	**2**
HMA Thickness (in) =	4	Funding:	**Layton**
Untreated Base Course Thickness (in) =	8	Type:	**Signal**
Granual Borrow Thickness (in) =	12		
Roadway Excavation Depth (ft) =	2		
Number of Sidewalks (No.) =	2		

Layton City
Transportation Master Plan

650 West: Weaver Lane to Gentile St

Collector

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10	27,000	$270,000
Removal of Existing Asphalt	S.Y.	$4	0	$0
Clearing and Grubbing	Acre	$2,000	5	$9,091
Roadway Excavation	C.Y.	$11	9,333	$98,000
HMA Concrete	Ton	$85	3,255	$276,675
Untreated Base Course	C.Y.	$15	3,111	$46,667
Granular Borrow	C.Y.	$40	4,667	$186,667
Curb and Gutter (2.5' width)	L.F.	$23	6,000	$135,000
Sidewalk (4' width)	L.F.	$25	6,000	$150,000
Drainage	L.F.	$45	6,000	$270,000
Right of Way	S.F.	$4	198,000	$792,000
Signage Striping	L.F.	$1	620	$620
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	1	$180,000
			Subtotal	**$2,414,719**

Contingency	25%	$603,680
Mobilization	10%	$241,472
Preconstruction Engineering	8%	$193,178
Construction Engineering	8%	$193,178
Total Project Costs		**$3,647,000**

Layton City's Responsibility	**15%**
	$541,000

Overall Assumptions:

HMA Pavement Density (pcf) =	155	Project No.	**3**
HMA Thickness (in) =	4	Funding:	**Layton**
Untreated Base Course Thickness (in) =	8	Type:	**Widen**
Granual Borrow Thickness (in) =	12		
Roadway Excavation Depth (ft) =	2		
Number of Sidewalks (No.) =	2		

Layton City Transportation Master Plan				
Layton Parkway: 1700 West to 2700 West Minor Arterial				
Costs				
Item	**Unit**	**Unit Cost**	**Quantity**	**Cost**
Parkstrip	S.F.	$10	23,400	$234,000
Removal of Existing Asphalt	S.Y.	$4	0	$0
Clearing and Grubbing	Acre	$2,000	5	$10,028
Roadway Excavation	C.Y.	$11	11,556	$121,333
HMA Concrete	Ton	$85	4,030	$342,550
Untreated Base Course	C.Y.	$15	3,852	$57,778
Granular Borrow	C.Y.	$40	5,778	$231,111
Curb and Gutter (2.5' width)	L.F.	$23	5,200	$117,000
Sidewalk (4' width)	L.F.	$30	5,200	$156,000
Drainage	L.F.	$45	5,200	$234,000
Right of Way	S.F.	$4	218,400	$873,600
Signage Striping	L.F.	$1	537	$537
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	0	$0
			Subtotal	**$2,377,937**

Contingency	25%	$594,484
Mobilization	10%	$237,794
Preconstruction Engineering	8%	$190,235
Construction Engineering	8%	$190,235
Total Project Costs		**$3,591,000**

Layton City's Responsibility	**29%**
	$1,039,000

Overall Assumptions:

HMA Pavement Density (pcf) =	155	Project No.	**4**
HMA Thickness (in) =	4	Funding:	**Layton**
Untreated Base Course Thickness (in) =	8	Type:	**New**
Granular Borrow Thickness (in) =	12		
Roadway Excavation Depth (ft) =	2		
Number of Sidewalks (No.) =	2		

Layton City
Transportation Master Plan

Fairfield Road: Gentile Street to Cherry Lane

Arterial

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10		
Removal of Existing Asphalt	S.Y.	$4	0	$0
Clearing and Grubbing	Acre	$2,000	0	$0
Roadway Excavation	C.Y.	$11	0	$0
HMA Concrete	Ton	$85	0	$0
Untreated Base Course	C.Y.	$15	0	$0
Granular Borrow	C.Y.	$40	0	$0
Curb and Gutter (2.5' width)	L.F.	$23	0	$0
Sidewalk (4' width)	L.F.	$25	0	$0
Drainage	L.F.	$45	0	$0
Right of Way	S.F.	$4	0	$0
Signage Striping	L.F.	$1	1,447	$1,447
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	1	$180,000
			Subtotal	**$181,447**

Contingency	25%	$45,362
Mobilization	10%	$18,145
Preconstruction Engineering	8%	$14,516
Construction Engineering	8%	$14,516
Total Project Costs		**$274,000**
Layton City's Responsibility	**100%**	**$274,000**

<u>Overall Assumptions:</u>

HMA Pavement Density (pcf) =	155	Project No.	**7**
HMA Thickness (in) =	6	Funding:	**Layton**
Untreated Base Course Thickness (in) =	8	Type:	**Widen**
Granular Borrow Thickness (in) =	12		
Roadway Excavation Depth (ft) =	2.167		
Number of Sidewalks (No.) =	2		

Layton City
Transportation Master Plan

Fairfield Road: Cherry Lane to Antelope Drive

Minor Arterial

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10	9,000	$90,000
Removal of Existing Asphalt	S.Y.	$4	4,000	$16,000
Clearing and Grubbing	Acre	$2,000	0	$826
Roadway Excavation	C.Y.	$11	1,778	$18,667
HMA Concrete	Ton	$85	620	$52,700
Untreated Base Course	C.Y.	$15	593	$8,889
Granular Borrow	C.Y.	$40	889	$35,556
Curb and Gutter (2.5' width)	L.F.	$23	2,000	$45,000
Sidewalk (4' width)	L.F.	$30	2,000	$60,000
Drainage	L.F.	$45	2,000	$90,000
Right of Way	S.F.	$4	18,000	$72,000
Signage Striping	L.F.	$1	0	$0
Bridge/Culvert	S.F.	$225	5,000	$1,125,000
Traffic Signal	Each	$180,000	0	$0
			Subtotal	**$1,614,638**

Contingency	25%	$403,659
Mobilization	10%	$161,464
Preconstruction Engineering	8%	$129,171
Construction Engineering	8%	$129,171
Total Project Costs		**$2,439,000**

Layton City's Responsibility	**100%**
	$2,439,000

<u>Overall Assumptions:</u>

HMA Pavement Density (pcf) =	155	Project No.	**8**
HMA Thickness (in) =	4	Funding:	**Layton**
Untreated Base Course Thickness (in) =	8	Type:	**Widen**
Granual Borrow Thickness (in) =	12		
Roadway Excavation Depth (ft) =	2		
Number of Sidewalks (No.) =	2		

Layton City
Transportation Master Plan

Antelope Drive: Hill Field Rd. to Oak Forest

Arterial

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10	0	$0
Removal of Existing Asphalt	S.Y.	$4	0	$0
Clearing and Grubbing	Acre	$2,000	0	$0
Roadway Excavation	C.Y.	$11	0	$0
HMA Concrete	Ton	$85	0	$0
Untreated Base Course	C.Y.	$15	0	$0
Granular Borrow	C.Y.	$40	0	$0
Curb and Gutter (2.5' width)	L.F.	$23	0	$0
Sidewalk (4' width)	L.F.	$25	0	$0
Drainage	L.F.	$45	0	$0
Right of Way	S.F.	$4	0	$0
Signage Striping	L.F.	$10	16,400	$164,000
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	0	$0
			Subtotal	**$164,000**

Contingency	25%	$41,000
Mobilization	10%	$16,400
Preconstruction Engineering	8%	$13,120
Construction Engineering	8%	$13,120
Total Project Costs		**$248,000**

Layton City's Responsibility	**100%**
	$248,000

Overall Assumptions:

HMA Pavement Density (pcf) =	155	Project No.	**9**
HMA Thickness (in) =	6	Funding:	**Layton**
Untreated Base Course Thickness (in) =	8	Type:	**Widen**
Granular Borrow Thickness (in) =	12		
Roadway Excavation Depth (ft) =	2.167		
Number of Sidewalks (No.) =	2		

Layton City
Transportation Master Plan

Layton Parkway: Angel (1200 West) to 1700 West

Minor Arterial

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10	24,300	$243,000
Removal of Existing Asphalt	S.Y.	$4	0	$0
Clearing and Grubbing	Acre	$2,000	5	$10,413
Roadway Excavation	C.Y.	$11	12,000	$126,000
HMA Concrete	Ton	$85	4,185	$355,725
Untreated Base Course	C.Y.	$15	4,000	$60,000
Granular Borrow	C.Y.	$40	6,000	$240,000
Curb and Gutter (2.5' width)	L.F.	$23	5,400	$121,500
Sidewalk (4' width)	L.F.	$30	5,400	$162,000
Drainage	L.F.	$45	5,400	$243,000
Right of Way	S.F.	$4	226,800	$907,200
Signage Striping	L.F.	$1	0	$0
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	0	$0
			Subtotal	**$2,468,838**

Contingency	25%	$617,210
Mobilization	10%	$246,884
Preconstruction Engineering	8%	$197,507
Construction Engineering	8%	$197,507
Total Project Costs		**$3,728,000**

Layton City's Responsibility	**29%**
	$1,079,000

Overall Assumptions:

HMA Pavement Density (pcf) =	155
HMA Thickness (in) =	4
Untreated Base Course Thickness (in) =	8
Granual Borrow Thickness (in) =	12
Roadway Excavation Depth (ft) =	2
Number of Sidewalks (No.) =	2

Project No.	**10**
Funding:	**Layton**
Type:	**New**

Layton City
Transportation Master Plan

Angel Street and Sugar Street Connection

Collector

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10	9,000	$90,000
Removal of Existing Asphalt	S.Y.	$4	0	$0
Clearing and Grubbing	Acre	$2,000	2	$3,030
Roadway Excavation	C.Y.	$11	3,111	$32,667
HMA Concrete	Ton	$85	1,085	$92,225
Untreated Base Course	C.Y.	$15	1,037	$15,556
Granular Borrow	C.Y.	$40	1,556	$62,222
Curb and Gutter (2.5' width)	L.F.	$23	2,000	$45,000
Sidewalk (4' width)	L.F.	$25	2,000	$50,000
Drainage	L.F.	$45	2,000	$90,000
Right of Way	S.F.	$4	66,000	$264,000
Signage Striping	L.F.	$1	0	$0
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	0	$0
			Subtotal	**$744,700**

Contingency	25%	$186,175
Mobilization	10%	$74,470
Preconstruction Engineering	8%	$59,576
Construction Engineering	8%	$59,576
Total Project Costs		**$1,125,000**

Layton City's Responsibility	**100%**
	$1,125,000

Overall Assumptions:

HMA Pavement Density (pcf) =	155	Project No.	**11**
HMA Thickness (in) =	4	Funding:	**Layton**
Untreated Base Course Thickness (in) =	8	Type:	**New**
Granual Borrow Thickness (in) =	12		
Roadway Excavation Depth (ft) =	2		
Number of Sidewalks (No.) =	2		

Layton City
Transportation Master Plan

1700 West: Gentile St to Layton Pkwy

Collector

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10	42,300	$423,000
Removal of Existing Asphalt	S.Y.	$4	0	$0
Clearing and Grubbing	Acre	$2,000	7	$14,242
Roadway Excavation	C.Y.	$11	14,622	$153,533
HMA Concrete	Ton	$85	5,100	$433,458
Untreated Base Course	C.Y.	$15	4,874	$73,111
Granular Borrow	C.Y.	$40	7,311	$292,444
Curb and Gutter (2.5' width)	L.F.	$23	9,400	$211,500
Sidewalk (4' width)	L.F.	$25	9,400	$235,000
Drainage	L.F.	$45	9,400	$423,000
Right of Way	S.F.	$4	310,200	$1,240,800
Signage Striping	L.F.	$1	971	$971
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	0	$0
			Subtotal	**$3,501,060**

Contingency	25%	$875,265
Mobilization	10%	$350,106
Preconstruction Engineering	8%	$280,085
Construction Engineering	8%	$280,085
Total Project Costs		**$5,287,000**
Layton City's Responsibility	**15%**	**$784,000**

<u>Overall Assumptions:</u>

HMA Pavement Density (pcf) =	155	Project No.	**12**
HMA Thickness (in) =	4	Funding:	**Layton**
Untreated Base Course Thickness (in) =	8	Type:	**New**
Granular Borrow Thickness (in) =	12		
Roadway Excavation Depth (ft) =	2		
Number of Sidewalks (No.) =	2		

Layton City
Transportation Master Plan

Layton Parkway: 2700 West to Bluff Ridge Blvd

Minor Arterial

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10	72,000	$720,000
Removal of Existing Asphalt	S.Y.	$4	32,000	$128,000
Clearing and Grubbing	Acre	$2,000	6	$12,489
Roadway Excavation	C.Y.	$11	14,222	$149,333
HMA Concrete	Ton	$85	4,960	$421,600
Untreated Base Course	C.Y.	$15	4,741	$71,111
Granular Borrow	C.Y.	$40	7,111	$284,444
Curb and Gutter (2.5' width)	L.F.	$23	16,000	$360,000
Sidewalk (4' width)	L.F.	$30	16,000	$480,000
Drainage	L.F.	$45	16,000	$720,000
Right of Way	S.F.	$4	272,000	$1,088,000
Signage Striping	L.F.	$1	1,653	$1,653
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	0	$0
			Subtotal	**$4,436,631**

Contingency	25%	$1,109,158
Mobilization	10%	$443,663
Preconstruction Engineering	8%	$354,930
Construction Engineering	8%	$354,930
Total Project Costs		**$6,700,000**

Layton City's Responsibility	**29%**
	$1,939,000

Overall Assumptions:

HMA Pavement Density (pcf) =	155
HMA Thickness (in) =	4
Untreated Base Course Thickness (in) =	8
Granual Borrow Thickness (in) =	12
Roadway Excavation Depth (ft) =	2
Number of Sidewalks (No.) =	2

Project No.	**13**
Funding:	**Layton**
Type:	**New**

Layton City
Transportation Master Plan

Frontage Road: 2000 North to 1450 South

Minor Collector

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10	13,500	$135,000
Removal of Existing Asphalt	S.Y.	$4	6,000	$24,000
Clearing and Grubbing	Acre	$2,000	0	$689
Roadway Excavation	C.Y.	$11	0	$0
HMA Concrete	Ton	$85	0	$0
Untreated Base Course	C.Y.	$15	0	$0
Granular Borrow	C.Y.	$40	0	$0
Curb and Gutter (2.5' width)	L.F.	$23	3,000	$67,500
Sidewalk (4' width)	L.F.	$25	3,000	$75,000
Drainage	L.F.	$45	3,000	$135,000
Right of Way	S.F.	$4	15,000	$60,000
Signage Striping	L.F.	$1	310	$310
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	0	$0
			Subtotal	**$497,499**

Contingency	25%	$124,375
Mobilization	10%	$49,750
Preconstruction Engineering	8%	$39,800
Construction Engineering	8%	$39,800
Total Project Costs		**$752,000**
Layton City's Responsibility	**100%**	**$752,000**

Overall Assumptions:

HMA Pavement Density (pcf) =	155	Project No.	**15**
HMA Thickness (in) =	3	Funding:	**Layton**
Untreated Base Course Thickness (in) =	8	Type:	**New**
Granual Borrow Thickness (in) =	0		
Roadway Excavation Depth (ft) =	0.9167		
Number of Sidewalks (No.) =	2		

Layton City
Transportation Master Plan

3200 West: Layton Parkway to Gordon

Collector

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10	45,000	$450,000
Removal of Existing Asphalt	S.Y.	$4	13,333	$53,333
Clearing and Grubbing	Acre	$2,000	2	$3,673
Roadway Excavation	C.Y.	$11	6,667	$70,000
HMA Concrete	Ton	$85	2,325	$197,625
Untreated Base Course	C.Y.	$15	2,222	$33,333
Granular Borrow	C.Y.	$40	3,333	$133,333
Curb and Gutter (2.5' width)	L.F.	$23	10,000	$225,000
Sidewalk (4' width)	L.F.	$25	10,000	$250,000
Drainage	L.F.	$45	10,000	$450,000
Right of Way	S.F.	$4	80,000	$320,000
Signage Striping	L.F.	$1	1,033	$1,033
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	0	$0
			Subtotal	**$2,187,331**

Contingency	25%	$546,833
Mobilization	10%	$218,733
Preconstruction Engineering	8%	$174,987
Construction Engineering	8%	$174,987
Total Project Costs		**$3,303,000**

Layton City's Responsibility	**100%**
	$3,303,000

Overall Assumptions:

HMA Pavement Density (pcf) =	155	Project No.	**17**
HMA Thickness (in) =	4	Funding:	**Layton**
Untreated Base Course Thickness (in) =	8	Type:	**Widen**
Granual Borrow Thickness (in) =	12		
Roadway Excavation Depth (ft) =	2		
Number of Sidewalks (No.) =	2		

Layton City
Transportation Master Plan

Gordon Ave: 1800 East to Highway 89

Minor Arterial

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10	52,200	$522,000
Removal of Existing Asphalt	S.Y.	$4	0	$0
Clearing and Grubbing	Acre	$2,000	11	$22,369
Roadway Excavation	C.Y.	$11	25,778	$270,667
HMA Concrete	Ton	$85	8,990	$764,150
Untreated Base Course	C.Y.	$15	8,593	$128,889
Granular Borrow	C.Y.	$40	12,889	$515,556
Curb and Gutter (2.5' width)	L.F.	$23	11,600	$261,000
Sidewalk (4' width)	L.F.	$30	11,600	$348,000
Drainage	L.F.	$45	11,600	$522,000
Right of Way	S.F.	$4	487,200	$1,948,800
Signage Striping	L.F.	$1	1,199	$1,199
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	0	$0
			Subtotal	**$5,304,629**

Contingency	25%	$1,326,157
Mobilization	10%	$530,463
Preconstruction Engineering	8%	$424,370
Construction Engineering	8%	$424,370

Total Project Costs	**$8,010,000**

Layton City's Responsibility	**100%**
	$8,010,000

Overall Assumptions:

HMA Pavement Density (pcf) =	155	Project No.	**18**
HMA Thickness (in) =	4	Funding:	**Layton**
Untreated Base Course Thickness (in) =	8	Type:	**New**
Granual Borrow Thickness (in) =	12		
Roadway Excavation Depth (ft) =	2		
Number of Sidewalks (No.) =	2		

Layton City
Transportation Master Plan

Signal: Wasatch Drive and Fairfield Road

Minor Arterial

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10	0	$0
Removal of Existing Asphalt	S.Y.	$4	0	$0
Clearing and Grubbing	Acre	$2,000	0	$0
Roadway Excavation	C.Y.	$11	0	$0
HMA Concrete	Ton	$85	0	$0
Untreated Base Course	C.Y.	$15	0	$0
Granular Borrow	C.Y.	$40	0	$0
Curb and Gutter (2.5' width)	L.F.	$23	0	$0
Sidewalk (4' width)	L.F.	$30	0	$0
Drainage	L.F.	$45	0	$0
Right of Way	S.F.	$4	0	$0
Signage Striping	L.F.	$1	0	$0
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	1	$180,000
			Subtotal	**$180,000**

Contingency	25%	$45,000
Mobilization	10%	$18,000
Preconstruction Engineering	8%	$14,400
Construction Engineering	8%	$14,400
Total Project Costs		**$272,000**

Layton City's Responsibility	**100%**
	$272,000

Overall Assumptions:

HMA Pavement Density (pcf) =	155	Project No.	**19**
HMA Thickness (in) =	4	Funding:	**Layton**
Untreated Base Course Thickness (in) =	8	Type:	**New**
Granular Borrow Thickness (in) =	12		
Roadway Excavation Depth (ft) =	2		
Number of Sidewalks (No.) =	2		

Layton City
Transportation Master Plan

Roundabout: 2700 West and Layton Parkway

Arterial

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10	0	$0
Removal of Existing Asphalt	S.Y.	$4	0	$0
Clearing and Grubbing	Acre	$2,000	0	$0
Roadway Excavation	C.Y.	$11	0	$0
HMA Concrete	Ton	$85	0	$0
Untreated Base Course	C.Y.	$15	0	$0
Granular Borrow	C.Y.	$40	0	$0
Curb and Gutter (2.5' width)	L.F.	$23	0	$0
Sidewalk (4' width)	L.F.	$25	0	$0
Drainage	L.F.	$45	0	$0
Right of Way	S.F.	$4	0	$0
Rounabout	Each	$250,000	1	$250,000
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	1	$180,000
			Subtotal	**$430,000**

Contingency	25%	$107,500
Mobilization	10%	$43,000
Preconstruction Engineering	8%	$34,400
Construction Engineering	8%	$34,400
Total Project Costs		**$650,000**
Layton City's Responsibility	**100%**	**$650,000**

Overall Assumptions:

HMA Pavement Density (pcf) =	155	Project No.	**20**
HMA Thickness (in) =	6	Funding:	**Layton**
Untreated Base Course Thickness (in) =	8	Type:	**New**
Granual Borrow Thickness (in) =	12		
Roadway Excavation Depth (ft) =	2.167		
Number of Sidewalks (No.) =	2		

Layton City
Transportation Master Plan

Eastridge Business Loop: Fairfield Rd (End of Existing) to Church St

Collector

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10	90,000	$900,000
Removal of Existing Asphalt	S.Y.	$4	28,889	$115,556
Clearing and Grubbing	Acre	$2,000	1	$2,755
Roadway Excavation	C.Y.	$11	11,852	$124,444
HMA Concrete	Ton	$85	4,133	$351,333
Untreated Base Course	C.Y.	$15	3,951	$59,259
Granular Borrow	C.Y.	$40	5,926	$237,037
Curb and Gutter (2.5' width)	L.F.	$23	20,000	$450,000
Sidewalk (4' width)	L.F.	$25	20,000	$500,000
Drainage	L.F.	$45	20,000	$900,000
Right of Way	S.F.	$4	60,000	$240,000
Signage Striping	L.F.	$1	2,067	$2,067
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	0	$0
			Subtotal	**$3,882,451**

Contingency	25%	$970,613
Mobilization	10%	$388,245
Preconstruction Engineering	8%	$310,596
Construction Engineering	8%	$310,596
Total Project Costs		**$5,863,000**
Layton City's Responsibility	**15%**	**$869,000**

Overall Assumptions:

HMA Pavement Density (pcf) =	155
HMA Thickness (in) =	4
Untreated Base Course Thickness (in) =	8
Granual Borrow Thickness (in) =	12
Roadway Excavation Depth (ft) =	2
Number of Sidewalks (No.) =	2

Project No.	**21**
Funding:	**Layton**
Type:	**New**

Layton City
Transportation Master Plan

Signal: Fairfield Road and Church Street

Minor Arterial

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10	0	$0
Removal of Existing Asphalt	S.Y.	$4	0	$0
Clearing and Grubbing	Acre	$2,000	0	$0
Roadway Excavation	C.Y.	$11	0	$0
HMA Concrete	Ton	$85	0	$0
Untreated Base Course	C.Y.	$15	0	$0
Granular Borrow	C.Y.	$40	0	$0
Curb and Gutter (2.5' width)	L.F.	$23	0	$0
Sidewalk (4' width)	L.F.	$30	0	$0
Drainage	L.F.	$45	0	$0
Right of Way	S.F.	$4	0	$0
Signage Striping	L.F.	$1	0	$0
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	1	$180,000
			Subtotal	**$180,000**

Contingency	25%	$45,000
Mobilization	10%	$18,000
Preconstruction Engineering	8%	$14,400
Construction Engineering	8%	$14,400
Total Project Costs		**$272,000**

Layton City's Responsibility	**100%**
	$272,000

Overall Assumptions:

HMA Pavement Density (pcf) =	155	Project No.	**24**
HMA Thickness (in) =	4	Funding:	**Layton**
Untreated Base Course Thickness (in) =	8	Type:	**Signal**
Granual Borrow Thickness (in) =	12		
Roadway Excavation Depth (ft) =	2		
Number of Sidewalks (No.) =	2		

Layton City
Transportation Master Plan

Signal: Gentile Street and 650 West

Minor Collector

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10		
Removal of Existing Asphalt	S.Y.	$4	0	$0
Clearing and Grubbing	Acre	$2,000	0	$0
Roadway Excavation	C.Y.	$11	0	$0
HMA Concrete	Ton	$85	0	$0
Untreated Base Course	C.Y.	$15	0	$0
Granular Borrow	C.Y.	$40	0	$0
Curb and Gutter (2.5' width)	L.F.	$23	0	$0
Sidewalk (4' width)	L.F.	$25	0	$0
Drainage	L.F.	$45	0	$0
Right of Way	S.F.	$4	0	$0
Signage Striping	L.F.	$1	0	$0
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	1	$180,000
			Subtotal	**$180,000**

Contingency	25%	$45,000
Mobilization	10%	$18,000
Preconstruction Engineering	8%	$14,400
Construction Engineering	8%	$14,400
Total Project Costs		**$272,000**

Layton City's Responsibility	**100%**
	$272,000

<u>Overall Assumptions:</u>

HMA Pavement Density (pcf) =	155	Project No.	**25**
HMA Thickness (in) =	3	Funding:	**Layton**
Untreated Base Course Thickness (in) =	8	Type:	**Signal**
Granual Borrow Thickness (in) =	0		
Roadway Excavation Depth (ft) =	0.9167		
Number of Sidewalks (No.) =	2		

Layton City
Transportation Master Plan

Signal: Hill Field Road and Cold Creek Way

Arterial

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10	0	$0
Removal of Existing Asphalt	S.Y.	$4	0	$0
Clearing and Grubbing	Acre	$2,000	0	$0
Roadway Excavation	C.Y.	$11	0	$0
HMA Concrete	Ton	$85	0	$0
Untreated Base Course	C.Y.	$15	0	$0
Granular Borrow	C.Y.	$40	0	$0
Curb and Gutter (2.5' width)	L.F.	$23	0	$0
Sidewalk (4' width)	L.F.	$25	0	$0
Drainage	L.F.	$45	0	$0
Right of Way	S.F.	$4	0	$0
Signage Striping	L.F.	$1	0	$0
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	1	$180,000
			Subtotal	**$180,000**

Contingency	25%	$45,000
Mobilization	10%	$18,000
Preconstruction Engineering	8%	$14,400
Construction Engineering	8%	$14,400
Total Project Costs		**$272,000**
Layton City's Responsibility	**100%**	**$272,000**

Overall Assumptions:

HMA Pavement Density (pcf) =	155	Project No.	**26**
HMA Thickness (in) =	6	Funding:	**Layton**
Untreated Base Course Thickness (in) =	8	Type:	**Signal**
Granular Borrow Thickness (in) =	12		
Roadway Excavation Depth (ft) =	2.167		
Number of Sidewalks (No.) =	2		

Layton City
Transportation Master Plan

Signal: Gordon Avenue and 3700 West

Minor Collector

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10		
Removal of Existing Asphalt	S.Y.	$4	0	$0
Clearing and Grubbing	Acre	$2,000	0	$0
Roadway Excavation	C.Y.	$11	0	$0
HMA Concrete	Ton	$85	0	$0
Untreated Base Course	C.Y.	$15	0	$0
Granular Borrow	C.Y.	$40	0	$0
Curb and Gutter (2.5' width)	L.F.	$23	0	$0
Sidewalk (4' width)	L.F.	$25	0	$0
Drainage	L.F.	$45	0	$0
Right of Way	S.F.	$4	0	$0
Signage Striping	L.F.	$1	0	$0
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	1	$180,000
			Subtotal	**$180,000**

Contingency	25%	$45,000
Mobilization	10%	$18,000
Preconstruction Engineering	8%	$14,400
Construction Engineering	8%	$14,400
Total Project Costs		**$272,000**
Layton City's Responsibility	**100%**	**$272,000**

Overall Assumptions:

HMA Pavement Density (pcf) =	155	Project No.	**27**
HMA Thickness (in) =	3	Funding:	**Layton**
Untreated Base Course Thickness (in) =	8	Type:	**Signal**
Granual Borrow Thickness (in) =	0		
Roadway Excavation Depth (ft) =	0.9167		
Number of Sidewalks (No.) =	2		

Layton City
Transportation Master Plan

Signal: Weaver Lane and Angel Street

Minor Collector

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10		
Removal of Existing Asphalt	S.Y.	$4	0	$0
Clearing and Grubbing	Acre	$2,000	0	$0
Roadway Excavation	C.Y.	$11	0	$0
HMA Concrete	Ton	$85	0	$0
Untreated Base Course	C.Y.	$15	0	$0
Granular Borrow	C.Y.	$40	0	$0
Curb and Gutter (2.5' width)	L.F.	$23	0	$0
Sidewalk (4' width)	L.F.	$25	0	$0
Drainage	L.F.	$45	0	$0
Right of Way	S.F.	$4	0	$0
Signage Striping	L.F.	$1	0	$0
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	1	$180,000
			Subtotal	**$180,000**

Contingency	25%	$45,000
Mobilization	10%	$18,000
Preconstruction Engineering	8%	$14,400
Construction Engineering	8%	$14,400
Total Project Costs		**$272,000**

Layton City's Responsibility	**100%**
	$272,000

Overall Assumptions:

HMA Pavement Density (pcf) =	155	Project No.	**28**
HMA Thickness (in) =	3	Funding:	**Layton**
Untreated Base Course Thickness (in) =	8	Type:	**Signal**
Granual Borrow Thickness (in) =	0		
Roadway Excavation Depth (ft) =	0.9167		
Number of Sidewalks (No.) =	2		

Layton City
Transportation Master Plan

Roundabout: Oak Hills Drive and Gentile Street

Arterial

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10	0	$0
Removal of Existing Asphalt	S.Y.	$4	0	$0
Clearing and Grubbing	Acre	$2,000	0	$0
Roadway Excavation	C.Y.	$11	0	$0
HMA Concrete	Ton	$85	0	$0
Untreated Base Course	C.Y.	$15	0	$0
Granular Borrow	C.Y.	$40	0	$0
Curb and Gutter (2.5' width)	L.F.	$23	0	$0
Sidewalk (4' width)	L.F.	$25	0	$0
Drainage	L.F.	$45	0	$0
Right of Way	S.F.	$4	0	$0
Signage Striping	L.F.	$1	0	$0
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$250,000	1	$250,000
			Subtotal	**$250,000**

Contingency	25%	$62,500
Mobilization	10%	$25,000
Preconstruction Engineering	8%	$20,000
Construction Engineering	8%	$20,000
Total Project Costs		**$378,000**
Layton City's Responsibility	**100%**	**$378,000**

Overall Assumptions:

HMA Pavement Density (pcf) =	155	Project No.	**29**
HMA Thickness (in) =	6	Funding:	**Layton**
Untreated Base Course Thickness (in) =	8	Type:	**Roundabout**
Granual Borrow Thickness (in) =	12		
Roadway Excavation Depth (ft) =	2.167		
Number of Sidewalks (No.) =	2		

Layton City
Transportation Master Plan

3650 West: Gordon Ave to Gentile Street

Minor Arterial

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10	20,700	$207,000
Removal of Existing Asphalt	S.Y.	$4	0	$0
Clearing and Grubbing	Acre	$2,000	1	$2,534
Roadway Excavation	C.Y.	$11	10,222	$107,333
HMA Concrete	Ton	$85	3,565	$303,025
Untreated Base Course	C.Y.	$15	3,407	$51,111
Granular Borrow	C.Y.	$40	5,111	$204,444
Curb and Gutter (2.5' width)	L.F.	$23	4,600	$103,500
Sidewalk (4' width)	L.F.	$30	4,600	$138,000
Drainage	L.F.	$45	4,600	$207,000
Right of Way	S.F.	$4	55,200	$220,800
Signage Striping	L.F.	$1	475	$475
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	2	$360,000
			Subtotal	**$1,905,224**

Contingency	25%	$476,306
Mobilization	10%	$190,522
Preconstruction Engineering	8%	$152,418
Construction Engineering	8%	$152,418
Total Project Costs		**$2,877,000**
Layton City's Responsibility	**29%**	**$835,000**

Overall Assumptions:

HMA Pavement Density (pcf) =	155
HMA Thickness (in) =	4
Untreated Base Course Thickness (in) =	8
Granular Borrow Thickness (in) =	12
Roadway Excavation Depth (ft) =	2
Number of Sidewalks (No.) =	2

Project No.	**30**
Funding:	**Layton**
Type:	**New**

Layton City
Transportation Master Plan

Signals: Layton Pkwy at 1700 West & 2200 West

Arterial

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10	0	$0
Removal of Existing Asphalt	S.Y.	$4	0	$0
Clearing and Grubbing	Acre	$2,000	0	$0
Roadway Excavation	C.Y.	$11	0	$0
HMA Concrete	Ton	$85	0	$0
Untreated Base Course	C.Y.	$15	0	$0
Granular Borrow	C.Y.	$40	0	$0
Curb and Gutter (2.5' width)	L.F.	$23	0	$0
Sidewalk (4' width)	L.F.	$25	0	$0
Drainage	L.F.	$45	0	$0
Right of Way	S.F.	$4	0	$0
Signage Striping	L.F.	$1	0	$0
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	2	$360,000
			Subtotal	**$360,000**

Contingency	25%	$90,000
Mobilization	10%	$36,000
Preconstruction Engineering	8%	$28,800
Construction Engineering	8%	$28,800
Total Project Costs		**$544,000**

Layton City's Responsibility	**100%**
	$544,000

Overall Assumptions:

HMA Pavement Density (pcf) =	155	Project No.	**31**
HMA Thickness (in) =	6	Funding:	**Layton**
Untreated Base Course Thickness (in) =	8	Type:	**Signal**
Granual Borrow Thickness (in) =	12		
Roadway Excavation Depth (ft) =	2.167		
Number of Sidewalks (No.) =	2		

Layton City
Transportation Master Plan

Signals: Gordon Ave at 1200 West (Angel St) and Cold Creek Way

Minor Collector

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10		
Removal of Existing Asphalt	S.Y.	$4	0	$0
Clearing and Grubbing	Acre	$2,000	0	$0
Roadway Excavation	C.Y.	$11	0	$0
HMA Concrete	Ton	$85	0	$0
Untreated Base Course	C.Y.	$15	0	$0
Granular Borrow	C.Y.	$40	0	$0
Curb and Gutter (2.5' width)	L.F.	$23	0	$0
Sidewalk (4' width)	L.F.	$25	0	$0
Drainage	L.F.	$45	0	$0
Right of Way	S.F.	$4	0	$0
Signage Striping	L.F.	$1	0	$0
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	2	$360,000
			Subtotal	**$360,000**

Contingency	25%	$90,000
Mobilization	10%	$36,000
Preconstruction Engineering	8%	$28,800
Construction Engineering	8%	$28,800
Total Project Costs		**$544,000**
Layton City's Responsibility	**100%**	**$544,000**

Overall Assumptions:

HMA Pavement Density (pcf) =	155
HMA Thickness (in) =	3
Untreated Base Course Thickness (in) =	8
Granular Borrow Thickness (in) =	0
Roadway Excavation Depth (ft) =	0.9167
Number of Sidewalks (No.) =	2

Project No.	**32**
Funding:	**Layton**
Type:	**Signal**

Layton City
Transportation Master Plan

Signal Modifications: Gentile Street at Wasach Drive, Fort Lane and Fairfield Road

Arterial

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10	0	$0
Removal of Existing Asphalt	S.Y.	$4	0	$0
Clearing and Grubbing	Acre	$2,000	0	$0
Roadway Excavation	C.Y.	$11	0	$0
HMA Concrete	Ton	$85	0	$0
Untreated Base Course	C.Y.	$15	0	$0
Granular Borrow	C.Y.	$40	0	$0
Curb and Gutter (2.5' width)	L.F.	$23	0	$0
Sidewalk (4' width)	L.F.	$25	0	$0
Drainage	L.F.	$45	0	$0
Right of Way	S.F.	$4	0	$0
Signage Striping	L.F.	$1	0	$0
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	3	$540,000
			Subtotal	**$540,000**

Contingency	25%	$135,000
Mobilization	10%	$54,000
Preconstruction Engineering	8%	$43,200
Construction Engineering	8%	$43,200
Total Project Costs		**$816,000**
Layton City's Responsibility	**15%**	**$123,000**

Overall Assumptions:

HMA Pavement Density (pcf) =	155	Project No.	**33**
HMA Thickness (in) =	6	Funding:	**Layton**
Untreated Base Course Thickness (in) =	8	Type:	**Signal**
Granual Borrow Thickness (in) =	12		
Roadway Excavation Depth (ft) =	2.167		
Number of Sidewalks (No.) =	2		

Layton City
Transportation Master Plan

Signals: Gordon Ave at Emerald Drive and 2600 East

Minor Arterial

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10	0	$0
Removal of Existing Asphalt	S.Y.	$4	0	$0
Clearing and Grubbing	Acre	$2,000	0	$0
Roadway Excavation	C.Y.	$11	0	$0
HMA Concrete	Ton	$85	0	$0
Untreated Base Course	C.Y.	$15	0	$0
Granular Borrow	C.Y.	$40	0	$0
Curb and Gutter (2.5' width)	L.F.	$23	0	$0
Sidewalk (4' width)	L.F.	$30	0	$0
Drainage	L.F.	$45	0	$0
Right of Way	S.F.	$4	0	$0
Signage Striping	L.F.	$1	0	$0
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	2	$360,000
			Subtotal	**$360,000**

Contingency	25%	$90,000
Mobilization	10%	$36,000
Preconstruction Engineering	8%	$28,800
Construction Engineering	8%	$28,800
Total Project Costs		**$544,000**
Layton City's Responsibility	**100%**	**$544,000**

Overall Assumptions:

HMA Pavement Density (pcf) =	155	Project No.	**34**
HMA Thickness (in) =	4	Funding:	**Layton**
Untreated Base Course Thickness (in) =	8	Type:	**Signal**
Granual Borrow Thickness (in) =	12		
Roadway Excavation Depth (ft) =	2		
Number of Sidewalks (No.) =	2		

Layton City
Transportation Master Plan

Roundabout: Antelope Drive and Church Street

Arterial

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10	0	$0
Removal of Existing Asphalt	S.Y.	$4	0	$0
Clearing and Grubbing	Acre	$2,000	0	$0
Roadway Excavation	C.Y.	$11	0	$0
HMA Concrete	Ton	$85	0	$0
Untreated Base Course	C.Y.	$15	0	$0
Granular Borrow	C.Y.	$40	0	$0
Curb and Gutter (2.5' width)	L.F.	$23	0	$0
Sidewalk (4' width)	L.F.	$25	0	$0
Drainage	L.F.	$45	0	$0
Right of Way	S.F.	$4	0	$0
Signage Striping	L.F.	$1	0	$0
Bridge/Culvert	S.F.	$225	0	$0
Roundabout	Each	$250,000	1	$450,000
			Subtotal	**$450,000**

Contingency	25%	$112,500
Mobilization	10%	$45,000
Preconstruction Engineering	8%	$36,000
Construction Engineering	8%	$36,000

Total Project Costs	**$680,000**

Layton City's Responsibility	**100%**
	$680,000

Overall Assumptions:

HMA Pavement Density (pcf) =	155	Project No.	**35**
HMA Thickness (in) =	6	Funding:	**Layton**
Untreated Base Course Thickness (in) =	8	Type:	**Roundabout**
Granular Borrow Thickness (in) =	12		
Roadway Excavation Depth (ft) =	2.167		
Number of Sidewalks (No.) =	2		

Layton City Transportation Master Plan				
Roundabout: Antelope Drive and Oak Forest Drive				
Arterial				
Costs				
Item	**Unit**	**Unit Cost**	**Quantity**	**Cost**
Parkstrip	S.F.	$10	0	$0
Removal of Existing Asphalt	S.Y.	$4	0	$0
Clearing and Grubbing	Acre	$2,000	0	$0
Roadway Excavation	C.Y.	$11	0	$0
HMA Concrete	Ton	$85	0	$0
Untreated Base Course	C.Y.	$15	0	$0
Granular Borrow	C.Y.	$40	0	$0
Curb and Gutter (2.5' width)	L.F.	$23	0	$0
Sidewalk (4' width)	L.F.	$25	0	$0
Drainage	L.F.	$45	0	$0
Right of Way	S.F.	$4	0	$0
Signage Striping	L.F.	$1	0	$0
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	1	$132,000
			Subtotal	**$132,000**

Contingency	25%	$33,000
Mobilization	10%	$13,200
Preconstruction Engineering	8%	$10,560
Construction Engineering	8%	$10,560
Total Project Costs		**$200,000**

Layton City's Responsibility	**100%**
	$200,000

Overall Assumptions:

HMA Pavement Density (pcf) =	155	Project No.	**36**
HMA Thickness (in) =	6	Funding:	**Layton**
Untreated Base Course Thickness (in) =	8	Type:	**Roundabout**
Granular Borrow Thickness (in) =	12		
Roadway Excavation Depth (ft) =	2.167		
Number of Sidewalks (No.) =	2		

Layton City
Transportation Master Plan

Signal: Fairfield Road and Rosewood Lane

Minor Arterial

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10	0	$0
Removal of Existing Asphalt	S.Y.	$4	0	$0
Clearing and Grubbing	Acre	$2,000	0	$0
Roadway Excavation	C.Y.	$11	0	$0
HMA Concrete	Ton	$85	0	$0
Untreated Base Course	C.Y.	$15	0	$0
Granular Borrow	C.Y.	$40	0	$0
Curb and Gutter (2.5' width)	L.F.	$23	0	$0
Sidewalk (4' width)	L.F.	$30	0	$0
Drainage	L.F.	$45	0	$0
Right of Way	S.F.	$4	0	$0
Signage Striping	L.F.	$1	0	$0
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	1	$180,000
			Subtotal	**$180,000**

Contingency	25%	$45,000
Mobilization	10%	$18,000
Preconstruction Engineering	8%	$14,400
Construction Engineering	8%	$14,400

Total Project Costs	**$272,000**

Layton City's Responsibility	**100%**
	$272,000

Overall Assumptions:

HMA Pavement Density (pcf) =	155	Project No.	**37**
HMA Thickness (in) =	4	Funding:	**Layton**
Untreated Base Course Thickness (in) =	8	Type:	**Signal**
Granual Borrow Thickness (in) =	12		
Roadway Excavation Depth (ft) =	2		
Number of Sidewalks (No.) =	2		

Layton City
Transportation Master Plan

Signal: Main Street and Fort Lane

Arterial

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10	0	$0
Removal of Existing Asphalt	S.Y.	$4	0	$0
Clearing and Grubbing	Acre	$2,000	0	$0
Roadway Excavation	C.Y.	$11	0	$0
HMA Concrete	Ton	$85	0	$0
Untreated Base Course	C.Y.	$15	0	$0
Granular Borrow	C.Y.	$40	0	$0
Curb and Gutter (2.5' width)	L.F.	$23	0	$0
Sidewalk (4' width)	L.F.	$25	0	$0
Drainage	L.F.	$45	0	$0
Right of Way	S.F.	$4	0	$0
Signage Striping	L.F.	$1	0	$0
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	1	$180,000
			Subtotal	**$180,000**

Contingency	25%	$45,000
Mobilization	10%	$18,000
Preconstruction Engineering	8%	$14,400
Construction Engineering	8%	$14,400
Total Project Costs		**$272,000**

Layton City's Responsibility	**100%**
	$272,000

Overall Assumptions:

HMA Pavement Density (pcf) =	155	Project No.	**38**
HMA Thickness (in) =	6	Funding:	**Layton**
Untreated Base Course Thickness (in) =	8	Type:	**Signal**
Granular Borrow Thickness (in) =	12		
Roadway Excavation Depth (ft) =	2.167		
Number of Sidewalks (No.) =	2		

Layton City
Transportation Master Plan

Signals: University Park Blvd and 2600 North

Minor Collector

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10		
Removal of Existing Asphalt	S.Y.	$4	0	$0
Clearing and Grubbing	Acre	$2,000	0	$0
Roadway Excavation	C.Y.	$11	0	$0
HMA Concrete	Ton	$85	0	$0
Untreated Base Course	C.Y.	$15	0	$0
Granular Borrow	C.Y.	$40	0	$0
Curb and Gutter (2.5' width)	L.F.	$23	0	$0
Sidewalk (4' width)	L.F.	$25	0	$0
Drainage	L.F.	$45	0	$0
Right of Way	S.F.	$4	0	$0
Signage Striping	L.F.	$1	0	$0
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	1	$180,000
			Subtotal	**$180,000**

Contingency	25%	$45,000
Mobilization	10%	$18,000
Preconstruction Engineering	8%	$14,400
Construction Engineering	8%	$14,400

Total Project Costs	**$272,000**

Layton City's Responsibility	**100%**
	$272,000

Overall Assumptions:

HMA Pavement Density (pcf) =	155	Project No.	**40**
HMA Thickness (in) =	3	Funding:	**Layton**
Untreated Base Course Thickness (in) =	8	Type:	**Signal**
Granular Borrow Thickness (in) =	0		
Roadway Excavation Depth (ft) =	0.9167		
Number of Sidewalks (No.) =	2		

Layton City
Transportation Master Plan

Signal: West Hillfield and Sugar Street

Minor Collector

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10		
Removal of Existing Asphalt	S.Y.	$4	0	$0
Clearing and Grubbing	Acre	$2,000	0	$0
Roadway Excavation	C.Y.	$11	0	$0
HMA Concrete	Ton	$85	0	$0
Untreated Base Course	C.Y.	$15	0	$0
Granular Borrow	C.Y.	$40	0	$0
Curb and Gutter (2.5' width)	L.F.	$23	0	$0
Sidewalk (4' width)	L.F.	$25	0	$0
Drainage	L.F.	$45	0	$0
Right of Way	S.F.	$4	0	$0
Signage Striping	L.F.	$1	0	$0
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	1	$180,000
			Subtotal	**$180,000**

Contingency	25%	$45,000
Mobilization	10%	$18,000
Preconstruction Engineering	8%	$14,400
Construction Engineering	8%	$14,400
Total Project Costs		**$272,000**
Layton City's Responsibility	**100%**	**$272,000**

Overall Assumptions:

HMA Pavement Density (pcf) =	155	Project No.	**41**
HMA Thickness (in) =	3	Funding:	**Layton**
Untreated Base Course Thickness (in) =	8	Type:	**Signal**
Granual Borrow Thickness (in) =	0		
Roadway Excavation Depth (ft) =	0.9167		
Number of Sidewalks (No.) =	2		

Layton City
Transportation Master Plan

Signal: Antelope and Hillfield Road

Arterial

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10	0	$0
Removal of Existing Asphalt	S.Y.	$4	0	$0
Clearing and Grubbing	Acre	$2,000	0	$0
Roadway Excavation	C.Y.	$11	0	$0
HMA Concrete	Ton	$85	0	$0
Untreated Base Course	C.Y.	$15	0	$0
Granular Borrow	C.Y.	$40	0	$0
Curb and Gutter (2.5' width)	L.F.	$23	0	$0
Sidewalk (4' width)	L.F.	$25	0	$0
Drainage	L.F.	$45	0	$0
Property Takes	Unit	$200,000	0	$0
Signage Striping	L.F.	$1	0	$0
Bridge/Culvert	Unit	$19,500,000	0	$0
Traffic Signal	Each	$180,000	1	$180,000
			Subtotal	**$180,000**

Contingency	25%	$45,000
Mobilization	10%	$18,000
Preconstruction Engineering	8%	$14,400
Construction Engineering	8%	$14,400

Total Project Costs	**$272,000**

Layton City's Responsibility	**100%**
	$272,000

Overall Assumptions:

HMA Pavement Density (pcf) =	155	Project No.	**43**
HMA Thickness (in) =	6	Funding:	**Layton**
Untreated Base Course Thickness (in) =	8	Type:	**Signal**
Granual Borrow Thickness (in) =	12		
Roadway Excavation Depth (ft) =	2.167		
Number of Sidewalks (No.) =	2		

Layton City
Transportation Master Plan

Signal: Gentile and Cold Creek Way

Arterial

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10		
Removal of Existing Asphalt	S.Y.	$4	0	$0
Clearing and Grubbing	Acre	$2,000	0	$0
Roadway Excavation	C.Y.	$11	0	$0
HMA Concrete	Ton	$85	0	$0
Untreated Base Course	C.Y.	$15	0	$0
Granular Borrow	C.Y.	$40	0	$0
Curb and Gutter (2.5' width)	L.F.	$23	0	$0
Sidewalk (4' width)	L.F.	$25	0	$0
Drainage	L.F.	$45	0	$0
Property Takes	Unit	$200,000	0	$0
Signage Striping	L.F.	$1	0	$0
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	1	$180,000
			Subtotal	**$180,000**

Contingency	25%	$45,000
Mobilization	10%	$18,000
Preconstruction Engineering	8%	$14,400
Construction Engineering	8%	$14,400

Total Project Costs	**$272,000**

Layton City's Responsibility	**100%**
	$272,000

<u>Overall Assumptions:</u>

HMA Pavement Density (pcf) =	155	Project No.	**44**
HMA Thickness (in) =	6	Funding:	**Layton**
Untreated Base Course Thickness (in) =	8	Type:	**Signal**
Granual Borrow Thickness (in) =	12		
Roadway Excavation Depth (ft) =	2.167		
Number of Sidewalks (No.) =	2		

Layton City
Transportation Master Plan

2700 West: Gentile Street to West Davis Corridor

Arterial

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10	36,000	$360,000
Removal of Existing Asphalt	S.Y.	$4	0	$0
Clearing and Grubbing	Acre	$2,000	9	$18,365
Roadway Excavation	C.Y.	$11	24,399	$256,188
HMA Concrete	Ton	$85	11,780	$1,001,300
Untreated Base Course	C.Y.	$15	7,506	$112,593
Granular Borrow	C.Y.	$40	11,259	$450,370
Curb and Gutter (2.5' width)	L.F.	$23	8,000	$180,000
Sidewalk (4' width)	L.F.	$25	8,000	$200,000
Drainage	L.F.	$45	8,000	$360,000
Right of Way	S.F.	$4	624,215	$2,716,859
Signage Striping	L.F.	$1	827	$827
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	1	$180,000
			Subtotal	**$5,836,502**

Contingency	25%	$1,459,125
Mobilization	10%	$583,650
Preconstruction Engineering	8%	$466,920
Construction Engineering	8%	$466,920

Total Project Costs	**$8,814,000**
Layton City's Responsibility	**42%**
	$3,671,000

<u>Overall Assumptions:</u>

HMA Pavement Density (pcf) =	155	Project No.	**45**
HMA Thickness (in) =	6	Funding:	**Layton**
Untreated Base Course Thickness (in) =	8	Type:	**New**
Granual Borrow Thickness (in) =	12		
Roadway Excavation Depth (ft) =	2.167		
Number of Sidewalks (No.) =	2		

Layton City
Transportation Master Plan

Angel Street: Gentile Street to Kaysville Border

Collector

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10		
Removal of Existing Asphalt	S.Y.	$4	8,800	$35,200
Clearing and Grubbing	Acre	$2,000	0	$0
Roadway Excavation	C.Y.	$11	4,400	$46,200
HMA Concrete	Ton	$85	1,535	$130,433
Untreated Base Course	C.Y.	$15	1,467	$22,000
Granular Borrow	C.Y.	$40	2,200	$88,000
Curb and Gutter (2.5' width)	L.F.	$23	6,600	$148,500
Sidewalk (4' width)	L.F.	$25	6,600	$165,000
Drainage	L.F.	$45	6,600	$297,000
Right of Way	S.F.	$4	0	$220,000
Signage Striping	L.F.	$1	682	$682
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	0	$0
			Subtotal	$1,153,015

Contingency	25%	$288,254
Mobilization	10%	$115,301
Preconstruction Engineering	8%	$92,241
Construction Engineering	8%	$92,241

Total Project Costs	$1,742,000
Layton City's Responsibility	100%
	$1,742,000

Overall Assumptions:

HMA Pavement Density (pcf) =	155	Project No.	**46**
HMA Thickness (in) =	4	Funding:	**Layton**
Untreated Base Course Thickness (in) =	8	Type:	**Widen**
Granular Borrow Thickness (in) =	12		
Roadway Excavation Depth (ft) =	2		
Number of Sidewalks (No.) =	2		

Layton City
Transportation Master Plan

Hill Field Road: Railroad Crossing

Arterial

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10	0	$0
Removal of Existing Asphalt	S.Y.	$4	0	$0
Clearing and Grubbing	Acre	$2,000	0	$0
Roadway Excavation	C.Y.	$11	0	$0
HMA Concrete	Ton	$85	0	$0
Untreated Base Course	C.Y.	$15	0	$0
Granular Borrow	C.Y.	$40	0	$0
Curb and Gutter (2.5' width)	L.F.	$23	0	$0
Sidewalk (4' width)	L.F.	$25	0	$0
Drainage	L.F.	$45	0	$0
Right of Way	S.F.	$4	0	$0
Signage Striping	L.F.	$1	0	$0
Bridge/Culvert	Unit	$19,500,000	1	$19,500,000
Traffic Signal	Each	$180,000	0	$0
			Subtotal	**$19,500,000**

Contingency	25%	$4,875,000
Mobilization	10%	$1,950,000
Preconstruction Engineering	8%	$1,560,000
Construction Engineering	8%	$1,560,000
Total Project Costs		**$29,445,000**
Layton City's Responsibility	**8%**	**$2,356,000**

Overall Assumptions:

HMA Pavement Density (pcf) =	155	Project No.	**47**
HMA Thickness (in) =	6	Funding:	**Layton/WFRC**
Untreated Base Course Thickness (in) =	8	Type:	**New**
Granual Borrow Thickness (in) =	12		
Roadway Excavation Depth (ft) =	2.167		
Number of Sidewalks (No.) =	2		

Layton City
Transportation Master Plan

Hill Field Road: 2200 West to 2700 West

Arterial

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10	23,400	$234,000
Removal of Existing Asphalt	S.Y.	$4	10,400	$41,600
Clearing and Grubbing	Acre	$2,000	2	$4,775
Roadway Excavation	C.Y.	$11	8,347	$87,643
HMA Concrete	Ton	$85	4,030	$342,550
Untreated Base Course	C.Y.	$15	2,568	$38,519
Granular Borrow	C.Y.	$40	3,852	$154,074
Curb and Gutter (2.5' width)	L.F.	$23	5,200	$117,000
Sidewalk (4' width)	L.F.	$25	5,200	$130,000
Drainage	L.F.	$45	5,200	$234,000
Right of Way	S.F.	$4	104,000	$416,000
Signage Striping	L.F.	$1	537	$537
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	0	$0
			Subtotal	**$1,800,698**

Contingency	25%	$450,175
Mobilization	10%	$180,070
Preconstruction Engineering	8%	$144,056
Construction Engineering	8%	$144,056
Total Project Costs		**$2,720,000**
Layton City's Responsibility	**42%**	**$1,133,000**

Overall Assumptions:

HMA Pavement Density (pcf) =	155
HMA Thickness (in) =	6
Untreated Base Course Thickness (in) =	8
Granular Borrow Thickness (in) =	12
Roadway Excavation Depth (ft) =	2.167
Number of Sidewalks (No.) =	2

Project No.	**48**
Funding:	**Layton**
Type:	**Widen**

Layton City
Transportation Master Plan

West Hillfield Road: 2700 West to 3650 West

Minor Arterial

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10	45,900	$459,000
Removal of Existing Asphalt	S.Y.	$4	13,600	$54,400
Clearing and Grubbing	Acre	$2,000	3	$5,620
Roadway Excavation	C.Y.	$11	13,600	$142,800
HMA Concrete	Ton	$85	4,743	$403,155
Untreated Base Course	C.Y.	$15	4,533	$68,000
Granular Borrow	C.Y.	$40	6,800	$272,000
Curb and Gutter (2.5' width)	L.F.	$23	10,200	$229,500
Sidewalk (4' width)	L.F.	$30	10,200	$306,000
Drainage	L.F.	$45	10,200	$459,000
Right of Way	S.F.	$4	122,400	$489,600
Signage Striping	L.F.	$1	1,054	$1,054
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	0	$0
			Subtotal	**$2,890,129**

Contingency	25%	$722,532
Mobilization	10%	$289,013
Preconstruction Engineering	8%	$231,210
Construction Engineering	8%	$231,210

Total Project Costs	**$4,365,000**

Layton City's Responsibility	**29%**
	$1,263,000

Overall Assumptions:

HMA Pavement Density (pcf) =	155	Project No.	**50**
HMA Thickness (in) =	4	Funding:	**Layton**
Untreated Base Course Thickness (in) =	8	Type:	**Widen**
Granual Borrow Thickness (in) =	12		
Roadway Excavation Depth (ft) =	2		
Number of Sidewalks (No.) =	2		

Layton City
Transportation Master Plan

Signal: 2100 East and Gordon Avenue

Minor Arterial

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10	0	$0
Removal of Existing Asphalt	S.Y.	$4	0	$0
Clearing and Grubbing	Acre	$2,000	0	$0
Roadway Excavation	C.Y.	$11	0	$0
HMA Concrete	Ton	$85	0	$0
Untreated Base Course	C.Y.	$15	0	$0
Granular Borrow	C.Y.	$40	0	$0
Curb and Gutter (2.5' width)	L.F.	$23	0	$0
Sidewalk (4' width)	L.F.	$30	0	$0
Drainage	L.F.	$45	0	$0
Right of Way	S.F.	$4	0	$0
Signage Striping	L.F.	$1	0	$0
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	1	$180,000
			Subtotal	**$180,000**

Contingency	25%	$45,000
Mobilization	10%	$18,000
Preconstruction Engineering	8%	$14,400
Construction Engineering	8%	$14,400
Total Project Costs		**$272,000**
Layton City's Responsibility	**100%**	**$272,000**

Overall Assumptions:

HMA Pavement Density (pcf) =	155	Project No.	**51**
HMA Thickness (in) =	4	Funding:	**Layton**
Untreated Base Course Thickness (in) =	8	Type:	**Signal**
Granual Borrow Thickness (in) =	12		
Roadway Excavation Depth (ft) =	2		
Number of Sidewalks (No.) =	2		

Layton City
Transportation Master Plan

Signal: Herritage Park and Layton Hills Parkway

Minor Collector

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10		
Removal of Existing Asphalt	S.Y.	$4	0	$0
Clearing and Grubbing	Acre	$2,000	0	$0
Roadway Excavation	C.Y.	$11	0	$0
HMA Concrete	Ton	$85	0	$0
Untreated Base Course	C.Y.	$15	0	$0
Granular Borrow	C.Y.	$40	0	$0
Curb and Gutter (2.5' width)	L.F.	$23	0	$0
Sidewalk (4' width)	L.F.	$25	0	$0
Drainage	L.F.	$45	0	$0
Right of Way	S.F.	$4	0	$0
Signage Striping	L.F.	$1	0	$0
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	1	$180,000
			Subtotal	**$180,000**

Contingency	25%	$45,000
Mobilization	10%	$18,000
Preconstruction Engineering	8%	$14,400
Construction Engineering	8%	$14,400

Total Project Costs	**$272,000**

Layton City's Responsibility	**100%**
	$272,000

Overall Assumptions:

HMA Pavement Density (pcf) =	155	Project No.	**52**
HMA Thickness (in) =	3	Funding:	**Layton**
Untreated Base Course Thickness (in) =	8	Type:	**Signal**
Granual Borrow Thickness (in) =	0		
Roadway Excavation Depth (ft) =	0.92		
Number of Sidewalks (No.) =	2		

Layton City
Transportation Master Plan

Fort Lane: 1500 North to Antelope Drive

Minor Arterial

Costs

Item	Unit	Unit Cost	Quantity	Cost
Parkstrip	S.F.	$10	14,400	$144,000
Removal of Existing Asphalt	S.Y.	$4	7,111	$28,444
Clearing and Grubbing	Acre	$2,000	1	$1,763
Roadway Excavation	C.Y.	$11	2,370	$24,889
HMA Concrete	Ton	$85	827	$70,267
Untreated Base Course	C.Y.	$15	790	$11,852
Granular Borrow	C.Y.	$40	1,185	$47,407
Curb and Gutter (2.5' width)	L.F.	$23	3,200	$72,000
Sidewalk (4' width)	L.F.	$30	3,200	$96,000
Drainage	L.F.	$45	3,200	$144,000
Right of Way	S.F.	$4	38,400	$153,600
Signage Striping	L.F.	$1	331	$331
Bridge/Culvert	S.F.	$225	0	$0
Traffic Signal	Each	$180,000	0	$0
			Subtotal	**$794,553**

Contingency	25%	$198,638
Mobilization	10%	$79,455
Preconstruction Engineering	8%	$63,564
Construction Engineering	8%	$63,564
Total Project Costs		**$1,200,000**

Layton City's Responsibility	**100%**
	$1,200,000

Overall Assumptions:

HMA Pavement Density (pcf) =	155	Project No.	**53**
HMA Thickness (in) =	4	Funding:	**Layton**
Untreated Base Course Thickness (in) =	8	Type:	**Widen**
Granual Borrow Thickness (in) =	12		
Roadway Excavation Depth (ft) =	2.00		
Number of Sidewalks (No.) =	2		

Appendix C: Corridor Preservation Process

The Utah Department of Transportation
Corridor Preservation Process

The Intermodal Surface Transportation Efficiency Act of 1991 formally introduced the concept of corridor preservation, requiring states to consider "preservation of rights of way for construction of future transportation projects…and identify those corridors for which action is most needed to prevent destruction or loss."

While strongly promoted at the federal level, it has been left to the individual states to develop techniques and programs for corridor preservation. The Utah Department of Transportation (UDOT) has developed a program that enables the state and local municipalities to preserve future transportation corridors by acquiring rights of way that meet certain eligibility requirements.

If you are interested in selling your property to the state for corridor preservation purposes, you must meet the following requirements to be eligible:

Bare Ground and/or Imminent Development

- Your land must be vacant (without constructed improvements), and soon to be developed.

- Your land is in a corridor that UDOT or the local municipality has identified for preservation.

Hardship

Health and Safety Considerations:

- Advanced age – needs care or assistance from others.
- Ambulatory defects or diseases – where present facilities are inadequate or cannot be maintained by the owner.
- Major disabilities or equivalent disabilities.
- Doctor's recommendation to change climate or physical environments.
- Non-decent, safe, and sanitary housing such as overcrowded living conditions if the occupancy level did not exceed decent, safe, and sanitary standards at the time the owner originally bought the property.

Financial Considerations:

- Probate or other litigation.
- Loss of employment.
- Retirement causing financial inability to maintain current residence, or purchase of retirement home.
- Pending mortgage foreclosure.
- Job transfer that creates a need to move.

- Financial Distress involving personal or business circumstances.
- Substantial Burden such as maintenance, taxes, and/or rehabilitation costs.
- Monetary Loss – Income or vacant properties. Eligible when the proposed project is the immediate cause of a monetary loss. The owner must demonstrate that the project creates an adverse impact upon business profitability or upon property. Non-transportation issues to be considered are:
    - Inability to obtain financing
    - Inherent risk of ownership associated with this type of property.
    - Other outside factors affecting the profitability of the business operation or property ownership.
    - Local governmental regulations affecting development or rehabilitation, such as requiring the owner to set aside right of way from development, without the requirement for dedication.

Application Process

If you believe you may qualify for advanced acquisition, you must apply for a Hardship Acquisition. Please follow the steps below in order to be considered for advanced acquisition using the Corridor Preservation Funds:

1. Completely fill out the Hardship Acquisition Questionnaire and attach all necessary documentation.

2. If needed, a letter may accompany the Questionnaire if further information is needed to describe your hardship.

3. The letter or questionnaire must include the property owner's name, address of the property and a telephone number.

4. In the documentation, please state the reason you believe you qualify for advanced acquisition, the estimated market value of the property and what steps, if any, you have taken to sell the property on the open market.

5. Please submit the information packet to:

    Utah Dept of Transportation
    P. O. Box 148420-8420
    Salt Lake City, UT 84114
    Attn: Dian McGuire

    Re: Corridor Preservation Fund

6. Upon receipt of your letter, you will be contacted by a UDOT representative that will explain the process to you.

7. An appraisal will be ordered by UDOT at no cost to you. The appraiser will be a qualified appraiser and will contact you directly. You have the right to accompany the appraiser during their site visit. This could take approximately 30 days.

8. A review appraiser will be hired to go over the appraisal report. The reviewer will review the report and validate the integrity of the report and help determine market value. This process may take 7 to 10 days.

9. Once UDOT has received the reports from both appraisers, your completed application packet will be evaluated at the next monthly Advisory Council meeting. The Advisory Council is a group of representatives from each of the Metropolitan Planning Organizations (MPOs), UDOT, and appointed members from the Transportation Commission.

10. If the Advisory Council recommends approval, your application will then be considered by the Transportation Commission for acquisition approval. The Transportation Commission meets monthly and may review your application the same month as the Advisory Council.

11. If the Transportation Commission approves your application, a UDOT representative will contact you with an explanation of the acquisition process. In the event of denial, you will receive a letter explaining your rights of appeal.

12. Please note that the advanced acquisition program using Corridor Preservation Funds is a voluntary process. Should you and the Department of Transportation be unable to reach an agreement on the terms of sale, the Department may withdraw their offer without any further obligation.

If you have additional questions concerning this process, please contact Dian McGuire at 801-633-6370 or dmcguire@utah.gov

Appendix D: Biking and Walking Elements

Policy Review Memorandum

To: Steven Lord, Horrocks Engineers

From: Tom Millar, Planner

Travis Jensen, Associate and Project Manager

Joe Gilpin, Principal

Alta Planning + Design

Date: August 26, 2014

1 Introduction

Various Layton City policies were reviewed to determine their effect on bicycling and walking. A "best practices" review was then conducted in the area of bicycle and pedestrian-related policies to develop appropriate recommendations that the City can modify and/or adopt. Basic descriptions of the recommended changes and additions are given in this memo along with information about where the City may find more detailed resources (if applicable) about the recommended policies.

As part of this plan, the consultant team reviewed:

- City of Layton General Plan
- City of Layton Municipal Code

The full policy and regulatory review is provided in the attached policy matrix.

2 Key Findings

Layton City has a number of very positive policies, codes, ordinances, and regulations that support walkable and bikeable environments. However, it is also evident that the City could significantly strengthen many areas of policy and code regarding facility definitions and standards, general support of pedestrian and bicyclist safety, traffic calming, walkable neighborhoods, access to schools, required bicycle parking, bicycle and pedestrian facility requirements, and enhancements within the context of development ordinances. Policies and standards geared toward making Layton safer and more welcoming for bicycling and walking are recommended and discussed within the attached policy matrix. Error! Reference source not found. below describes key strengths identified within the existing ordinances and policies of the City, as well as priority areas for improvement.

Strengths

- General ordinance supporting pedestrian and bicycle safety
- Maximum block sizes in residential and agricultural zones
- Pedestrian accommodations in parking lots in mixed use zones
- Good ordinance language requiring property owner participation in sidewalk maintenance
- Good language prohibiting obstructions to sidewalks
- Good language requiring overhangs and shelters to protect pedestrians in mixed use zones

Priority Areas for Improvement

- Develop a comprehensive Complete Streets Ordinance
- Require pedestrian improvements with new development and redevelopment (sidewalks, lighting, street trees, etc.)
- Develop citywide bicycle parking requirements
- Update suburban, auto-oriented development standards to be more context-based and pedestrian-friendly
- Develop policy and ordinances for required width and installation of sidewalks
- Expand the walking and bicycling-friendly requirements that exist in mixed use zones to all non-residential and non-agricultural zones in the City

3 Conclusion

It is clear that adapting best practices from across the country into the existing code would serve as an efficient approach to improving existing conditions while facilitating new walkable and bikeable development. The City's development standards are primarily oriented towards automobile access. Walkability begins with access to destinations through the minimization of out of direction travel, compact distances, and a pleasant overall aesthetic. To the extent politically feasible, the City and its partners in the County and State agencies should promote development that is proximate to existing infrastructure, residential development, and existing destinations for education, employment, commerce, and civic activities. This begins with allowing and promoting a mixture of land uses and at a density that supports walking and bicycle access. Walkable land use patterns are critical to quality of life Layton residents and visitors

Promoting "complete" infrastructure and transportation linkages between land uses will help ensure that destinations within Layton that are proximate in distance are indeed comfortable and safe to walk or bike to and from. Pedestrian and bicycle access should be considered in every applicable requirement and ordinance, like the development of sidewalks, provision of bicycle parking and street trees, and pedestrian-scaled lighting. Standards should also consider whether or not building and lots are oriented for pedestrian and bicycle access.

The comments and recommendations in the attached policy matrix outline many opportunities for making local development standards more pedestrian and bicycle friendly. This plan suggests that City staff and appropriate appointed committees develop proposed text amendments they consider easy to accomplish in the short term. For more structural changes, staff, committees, and the Plan committee members should incorporate changes into the upcoming comprehensive audit and rewrite of development standards over the next 12-18 months. The outcome of such an effort will be development standards that are predictable and sustainable for investors and developers, but that also promote active living, aging in place, quality of life, the local character of Layton, and transportation and recreation choices.

Topic	Review: City of Layton Municipal Code ("Code"), Other Regulations, or Policies	Review: Comments/Suggestions
1. DEFINITIONS and SUPPORTING ORDINANCES		
1.1 Does "Street" definition include pedestrian, cyclist, and transit reference?	No definition listed.	Consider adding language to the Code to reflect the City's intent to include and safely accommodate pedestrians, cyclists, transit users, etc.: Example: *The term "street" includes avenues, boulevards, highways, roads, alleys, lanes, viaducts, bridges and the approaches thereto and all other public thoroughfares in the city, and means the entire width thereof between opposed abutting property lines. It shall be construed to include a sidewalk or footpath and accommodations for bicyclists, transit riders, and persons of all abilities as deemed contextually appropriate unless the contrary is expressed or unless such construction would be inconsistent with the manifest intent of the city council.*
1.2 Definition of right of way	The Code states that public right of way widths are measured from lot line to lot line. Because the Code does not specify or require a minimum number of motor vehicle traffic lanes, each roadway classification type's right of way width can be dedicated to other uses like street trees, wider sidewalks, bike lanes, paths, and center medians or pedestrian refuge islands.	Define and prioritize non-motorized roadway elements within the right of way.
1.3 Definition of vehicle	No definition listed.	Some cities' and states' definition of 'vehicle' includes the bicycle. Include an express definition of vehicle, including bicycles. Doing so will add validity to bicyclists' presence on the roadway and to planning and designing for and accommodating bicyclists.
1.4 Definition of sidewalk	No definition listed.	Add a definition of sidewalk that defines it as part of the public right of way.
1.5 Definition of bicycle	No definition listed.	MUTCD Definition: *A pedal-powered vehicle upon which the human operator sits.*
1.6 Types and definition of facilities specified or allowed	None found.	Define different types of bicycle facilities and establish a hierarchy.
1.7 Definition of greenway or shared use path	No definition of greenway or shared use path listed.	Potential definition: *A linear open space established along or adjacent to a manmade corridor, like a street, or a natural corridor, such as a river, stream, ridgeline, rail-trail, canal, or other route for conservation, recreation, and shared-use alternative transportation purposes such as pedestrians and cyclists.*
1.8 General ordinances supporting pedestrian and bicycle safety	Needs improvement. The Municipal Code and General Plan Land Use Element include several policies and regulations that are supportive of pedestrian and bicyclist safety and comfort including: - Prohibition on opening doors into traffic - Prohibition on parking on sidewalk or curb - Prohibition of bicyclists and pedestrians on limited access highways - Authorizing Play Streets - Definition of speed limits for motor vehicles (De facto: 25 mph) - Definition of and directives on the installation of control devices - New elementary schools recommended to be located near the center of residential areas and not on edges and/or on arterial streets - Prohibition of operation of motor vehicle on public property that is not a highway or street (i.e. motor vehicles on shared use paths, trails, sidewalks, or other facility designed for bicyclists and pedestrians) - Requirements for prompt snow removal from sidewalks (within 12 hours), especially on sidewalks where children walk to and from schools or parks. Exempt sidewalks: along agriculture frontage or where children would not walk to and from schools or parks.	The regulations and policies listed at left are some of the most helpful the documents reviewed. The authorization of play streets, requirement for prompt snow removal on sidewalks, and the prohibition on opening doors into traffic (which helps to protect bicyclists in the roadway and pedestrians on narrow sidewalks) are especially commendable for supporting pedestrian and bicycle comfort and safety. Changes and additions to consider include: - Disallowing driving, parking, or blocking designated bikeways, including bike lanes - Other allowances for and restrictions on bicycle travel such as prohibitions on wrong-way riding, riding without lights, riding with headphones - Other protections for bicyclists and pedestrians including: anti-harassment ordinances, safe passing of cyclists requirements (if a requirement stricter than the state's 3' passing rule is desired by the City), etc. See the following documents for comprehensive recommendations for policy and regulatory tools to support walking and bicycling and transit access: - *Making Neighborhoods More Walkable and Bikeable*, ChangeLab Solutions: http://changelabsolutions.org/sites/default/files/MoveThisWay_FINAL-20130905.pdf - *Getting the Wheels Rolling: A Guide to Using Policy to Create Bicycle Friendly Communities,* ChangeLab Solutions *http://changelabsolutions.org/bike-policies*

Topic	Review: City of Layton Municipal Code ("Code"), Other Regulations, or Policies	Review: Comments/Suggestions
1.9 School property regulations on vehicular traffic	Per State Code, cities can adopt rules and regulations for the control of vehicular traffic and parking on school property. Layton's City Council has stated that the City's traffic code is applicable and enforceable on school property within city limits and that the places where vehicles operate on school property are considered public streets, roads, or highways. Special rules or exceptions can be made for particular schools.	None.
2. STREET ELEMENTS AND CONFIGURATION		
2.1.1 Pedestrian and bicycle accommodations required during new development or redevelopment 2.1.2 New sidewalks, bike lanes, greenways, etc. - connect to existing facilities, general connectivity requirements	No requirements for accommodations or connectivity found.	Include access to transit in the list of priority destinations for sidewalk provisions. Consider adding requirements, typical sections, elements, and similar suggested language for bike lanes, other dedicated bicycle infrastructure, and greenways, including reservation, dedication, or provision in new developments where a greenway or trail is shown on an adopted plan or where a property connects to an existing or proposed greenway. Establish guidelines and requirements so that bicycle and pedestrian accommodation and access is maintained during development and construction.
2.2 Cross-access between adjacent land parcels in subdivisions	No requirements of design guidelines found.	Add section in subdivision regulations to require cross-access between adjacent parcels to facilitate non-motorized (pedestrian and bicycle) access. Requiring cross-access between adjacent parcels of land is a great tool for reducing the amount of traffic on major roads while increasing connectivity for pedestrians, bicycles, and cars.
2.3 Block size	Needs improvement to promote walking, biking and transit access. In Layton, maximum block lengths are only specified for three of the 18 total zoning district types in City limits: - Agriculture – No maximum - Residential suburban – 1,000' - Single family residential (10) – 800' - Single family residential (8) – 700' - Single family residential (6) – 600' If a block is over 800' in length, which is possible only in an agriculture zone, the Planning Commission may require a dedicated walkway not less than 10' wide through the block approximately at its center. The Code states that the length, width, and shape of blocks in the City shall provide convenient and safe circulation and access for pedestrians and vehicles.	Long block lengths can make walking less attractive and more difficult. Shorter blocks (and therefore more blocks and streets) create more opportunities for street-fronting commerce, more access and mobility for walking and bicycling, can calm vehicle speeds, and therefore reduce the impact of collisions. Small block size is also important to intersection density and interconnectivity which serve to enhance walking, bicycling, and transit-access opportunities. Ideally, block size should not exceed 1000'-1200' for low density residential development (which Layton's Code does well). Where blocks exceed this length, a mid-block crosswalk should be required. In higher density areas like MU and MU-TOD zones, blocks can be as narrow as 200-400' wide. Block length should be tied to density of development.
2.4 Dead end streets	Needs improvement. The Code states that streets terminating in cul-de-sacs shall be no longer than 500' to the end of the turn-around.	Street interconnectivity is critical to successful bicycle/pedestrian networks. Furthermore, long dead-end streets create challenges for pedestrians, cyclists, and effective transit and other public services. Consider amending this section of the code with the following: *Cul-de-sacs may be permitted only where topographic conditions and/or exterior lot line configurations offer no practical alternatives for connection or through traffic. Cul-de-sacs shall have pedestrian and bicycle neighborhood access trails at the ends to connect to adjacent streets. Where possible, a close is preferred over a cul-de-sac.*
2.5 Setback maximums in highway corridor commercial districts	Needs improvement. According to the General Plan land use policies, the maximum lot depth off of each arterial street should be established based on existing man-made and natural boundaries, along with the consideration of adjacent uses. Where no such boundaries exist, a maximum depth of 200' to 400' from the street should be the general rule.	Setbacks of 200' to 400', even in highway corridor commercial districts where cars are very dominant, impede pedestrian ease of use, accessibility, and safety. Deep setbacks create more open corridors where traffic speeds are high and pedestrian safety and comfort are generally low. In order to promote walking and bicycling, the City should create reasonable yet strict setback minimum and maximum requirements in order to promote and require human-scaled development in all commercial and non-residential or agricultural zones.

Topic	Review	
	City of Layton Municipal Code ("Code"), Other Regulations, or Policies	Comments/Suggestions
2.6 Multi-family and mobile home land use policies	In Layton's General Plan, several policies regarding multi-family and mobile home land uses require these uses to be located on and provide access to abutting arterial streets. Because of the inherent risk of having children living in homes within these land uses adjacent to high volume and high speed roads, the General Plan requires these uses to include adequate safety provisions (fencing along the street). In mobile home developments, it states that access should only be to and from arterial streets. Access to local streets should be for emergency purposes only.	Consider amending the requirements and policies regarding multi-family and mobile home land uses by encouraging pedestrian connections external to the development. This is important to create inviting pedestrian and bicycle links to quieter local streets, particularly where parks, shopping and schools are proximate.
3. PEDESTRIAN FRIENDLY BUILDINGS AND SITE DESIGN STANDARDS		
3.1 Off-street motorized vehicle parking is behind or to side of buildings	No information found.	Consider requiring motorized vehicle parking that is behind or to the side of buildings in pedestrian-oriented zoning districts (like, but not limited to, MU and MU-TOD) to improve the pedestrian-orientation of buildings and to minimize the need for pedestrians to walk through parking lots to access buildings.
3.2 Automobile parking requirements defined	Minimum off-street parking requirements are required for all uses and the amount of parking is defined by each land use type. Maximum distance from off-premise parking to the building site cannot be more than 500' along the shortest pedestrian route. Access to parking spaces in private parking lots must be made from private roadways and not from public streets. When two dissimilar uses are adjacent to each other and the demand for parking at those uses do not conflict, the Board of Adjustment can authorize changing the maximum number of spaces to the requirement for the larger use.	The City should consider additional ways in which it can share or pool parking in order to maximize usable land and create pedestrian-scale places. Moreover, by including principles from 'Topic 3.4 – Bicycle parking requirements', the City can allow a reduction incentive to property and land owners for minimum automobile parking spaces. Creating maximums for automobile parking spaces will require applicants to satisfy the demand at their location with supply of bike parking and other amenities that can accommodate those who do not drive a car.
3.3 Pedestrian walkways in parking lots	Good. Broader application is recommended. In mixed use (MU) and mixed use transit-oriented development (MU-TOD) zones, where feasible, pedestrian walkways are required in parking lots of any size. Those with more than 100 spaces must be divided by landscaped areas that include a 10' (minimum width) walkway. Overall, the Code requires and recommends that these district types have many of the elements of a walkable and bikeable area.	Expand the requirement for pedestrian walkways in parking lots of any size to all zones in the City, not just mixed use development.
3.4 Bicycle parking requirements	Space for public seating and bicycle parking near entrances to buildings of groups of buildings in mixed use zones is required. The Code states that the design standards of the zone should create pedestrian and bicycle friendly areas. Except in mixed use zones, bicycle parking is not required per the Code.	Incorporate bicycle parking requirements throughout the section describing on- and off-street parking. Even though bicycle parking is required near entrances in mixed use zones, construction specifications, spacing, amount, and cost-sharing or installation of bicycle parking are not outlined. References for best practices in bicycle parking requirements: • Bicycle Parking Model Ordinance, Change Lab Solutions: http://changelabsolutions.org/publications/bike-parking • *Bicycle Parking Guidelines, 2nd Edition – by the Association of Pedestrian and Bicycle Professionals (APBP; available for purchase)* • The Model Bicycle Parking Ordinance developed by the Public Health Law & Policy group provides excellent model language for bicycle parking requirements and related amenities, including showers and changing areas: http://www.atpolicy.org/sites/default/files/Model%20Bike%20Parking%20Ordinance%20with%20Annotations%20-%20Public%20Health%20Law%20and%20Policy.pdf
3.5 Site amenities for cyclists and others (showers, changing areas, etc.)	No guidelines or requirements found.	Consider requiring or providing incentives to encourage the installation of site amenities such as showers, storage lockers, and changing areas for bicyclists and others for commercial and educational sites. Minimum requirements can be determined by number of employees, tenants, or students. The Model Bicycle Parking Ordinance developed by the Public Health Law & Policy group provides excellent model language for bicycle parking requirements and related amenities, including showers and changing areas: http://www.atpolicy.org/sites/default/files/Model%20Bike%20Parking%20Ordinance%20with%20Annotations%20-%20Public%20Health%20Law%20and%20Policy.pdf
3.6 Other place-supportive parking regulations (On-street parking, shared parking, pricing, employer incentives/programs, etc.)	No guidelines or requirements found.	Require or incentivize shared parking and parking reductions in pedestrian-oriented districts, especially where pedestrians are potentially present.

Topic	Review	
	City of Layton Municipal Code ("Code"), Other Regulations, or Policies	Comments/Suggestions
3.7 Pedestrian-scale lighting (< 15' tall) required along sidewalks, paths and in parking areas	No guidelines or requirements found.	Incorporate appropriate-scale lighting (<15' tall) considerations for bicyclists and pedestrians where appropriate.
3.8 Pedestrian-protective overhangs and shelters	In mixed use zones, roofs, alcoves, porticos, and other overhangs shall be incorporated into building design to protect pedestrians from the elements. Buildings within 30' of the street shall have an attractive and functional pedestrian entrance facing the street.	Expand this requirement to all commercial or other mixed use zones, or any zones where buildings that are accessed by the public exist.
4. PEDESTRIAN FACILITY DESIGN		
4.1 Minimum sidewalk width by context	No guidelines found for non-mixed use zones. Only the MU and MU-TOD zones have sidewalk width requirement (8' minimum).	The best standards would require or provide sidewalks on both sides of all collector and arterial streets and on *at least* one side of local streets where warranted by density and/or system connectivity. 5' wide sidewalks along local streets and 6' wide sidewalks along collectors and arterials are preferred minimum widths. 5' is the minimum width required for two adults to walk side-by-side. The land use context and density of development necessitates a greater level of requirement for sidewalk specifications. In areas such as downtown with buildings at the back of the sidewalk and ground level retail, sidewalks should be as wide as 10-18' wide.
4.2 Street trees	Needs improvement. Not required between sidewalk and the curb or in any non-mixed use zones. In mixed use zones in Layton, for example, street trees are required on all street frontages at a spacing of 20' (minimum) to 30' (maximum) on center.	In addition to their value for improving the air quality, water quality, and beauty of a community, street trees can help slow traffic and improve comfort for pedestrians. Trees add visual interest to streets and narrow the street's visual corridor, which may cause drivers to slow down. When planted in a planting strip between the sidewalk and the curb, street trees also provide a buffer between the pedestrian zone and the street. Expand the requirement for the presence, location, and spacing of street trees to all non-agricultural zones within the City.
5. BICYCLE FACILITY DESIGN		
5.1 Bicycle facility design guidelines, plan, or manual	None found.	Incorporate bicycle facility design best practices into the Code and other appropriate City design requirements. The Design Guidelines developed for this Plan, as well as resources in this memo, will provide specific design guidelines and reference to national design guidelines. The City should also consider adopting the NACTO Urban Bikeway Design Guide as an official set of design guidelines for bikeway design, definitions, and construction.
6. COMPLETE STREETS SUPPORTING POLICIES AND MANUALS		
6.1 Complete Streets Ordinance	Layton has not adopted a Complete Streets ordinance.	Consider adopting a Complete Streets ordinance. The ordinance would require that all city owned transportation facilities in the public right of way on which bicyclists and pedestrians are permitted by law, including, but not limited to, streets, bridges, and all other connecting pathways, be designed, constructed, operated, and maintained so that users, including people with disabilities, can travel safely and independently. Salt Lake City adopted a Complete Streets ordinance in 2010 and has tremendously improved bikeability and walkability since that time. http://www.bikeslc.com/GetInvolved/MasterPlansandPolicies/PDF/CompleteStreetsOrdinance.pdf
6.2 Traffic calming programs, policies, and/or manuals	None found.	Consider adopting traffic calming programs, especially near schools and in commercial, mixed use, Downtown, or Village Center districts.
6.3 Consideration of pedestrian and bicycle concerns and Level of Service (LOS) in Traffic Impact Analyses and other required engineering studies	None found.	In September 2013, the State of California did away with the Level of Service requirement in their environmental review process. Previously, a law required every roadway project (including transit, bicycling, or walking projects) to include a Level of Service analysis in the project's environmental review process. Previously, if a project adversely affected vehicular level of service, it would not receive environmental clearance or funding. Consider adopting a multi-modal level of service standard for future projects. For example, the MMLOS can be used to determine the best way to accommodate multi-modal traffic in new developments where active transportation and transit use are expected to be high. Consideration of bicycle and pedestrian levels of service can lend credibility to providing or improving adequate facilities for bicyclists and pedestrians.

Topic	Review	
	City of Layton Municipal Code ("Code"), Other Regulations, or Policies	Comments/Suggestions
6.4 Access management program or policy	None found.	Consider adding language across all types of development pertaining to non-motorized vehicle and pedestrian access management; this could broadly be incorporated into zoning districts requirements or street design standards.
6.5 Sidewalk retrofit/infill program or policy	None found.	The communities should consider developing sidewalk infill and maintenance program where City staff periodically inventory the street network to identify sidewalk gaps, and develop strategies, project prioritization criteria and funding for completing these gaps. Potential project prioritization criteria include filling gaps along key pedestrian routes, near major pedestrian trip generators like schools, transit routes, and along streets with high vehicle volumes.
6.6 Sidewalk maintenance requirements and obstructions	Sidewalks, curb, and gutter must be kept in good repair and otherwise safe conditions by the abutting or fronting property owners.	Enforcement of the obstructions language is critical and could provide a basis for removal of all kinds of temporary (e.g., trash cans) and more fixed obstructions in pedestrian ways (e.g., utility poles, sign poles). A systematic code enforcement program, public comment channel, and/or division could help Layton City enforce the municipal code (especially if several new requirements recommended in this policy review are adopted). Large and small cities like Los Angeles, CA; Virginia Beach, VA; Bryan, TX; and Watsonville, CA (which has a similar city profile where agricultural and suburban interests compete), have adopted and implemented code enforcement programs, public comment channels, and/or divisions to this end. • Los Angeles, CA: http://lahd.lacity.org/lahdinternet/CodeEnforcement/tabid/327/language/en-US/Default.aspx • Virginia Beach, VA: http://www.vbgov.com/government/departments/housing-neighborhood-preservation/code-enforcement/Pages/default.aspx • Bryan, TX: http://www.bryantx.gov/planning-and-development-services/code-enforcement/ • Watsonville, CA: http://cityofwatsonville.org/permits-plans/building-division/code-enforcement-complaints
7. ITEMS REVIEWED		
7.1 Names of Resources	GUIDELINES AND REGULATIONS: 1. City of Layton, Utah Municipal Code ("Code"): http://www.laytoncity.org/public/depts/legal/MunicipalCode.aspx ADDITIONAL POLICIES AND ORDINANCES: 1. City of Layton, Utah General Plan Land Use Element Policies: https://www.laytoncity.org/downloads/CD/Planning/GeneralPlan/GeneralPlanLandUseElement.pdf	REFERENCES AND HELPFUL RESOURCES 1. *Making Neighborhoods More Walkable and Bikeable*, ChangeLab Solutions: http://changelabsolutions.org/sites/default/files/MoveThisWay_FINAL-20130905.pdf 2. *Getting the Wheels Rolling: A Guide to Using Policy to Create Bicycle Friendly Communities,* ChangeLab Solutions *http://changelabsolutions.org/bike-policies* 3. *Bicycle Parking Guidelines, 2nd Edition* – by the Association of Pedestrian and Bicycle Professionals (APBP) 4. *Complete Streets Local Policy Workbook* – by the National Complete Streets Coalition and Smart Growth America 5. *NACTO Urban Bikeway Design Guide* – by the National Association of City Transportation Officials (NACTO) 6. 2010 ADA Standards for Accessible Design - http://www.ada.gov/2010ADAstandards_index.htm

Appendix E: Cross Section and Design Guidelines

Cross Sections and Design Guidelines Memorandum

To: Steven Lord, Horrocks Engineers

From: Tom Millar and Travis Jensen, Alta Planning + Design

Date: May 16, 2014

Alta Planning + Design has been tasked with creating graphics showing different types of bikeway facility cross sections and design guidelines, showing general recommended characteristics (e.g. width, relationship to parking) for each of the following facility types:

- Signed shared roadway
- Marked shared roadway
- Bicycle boulevard
- Bike lane
- Buffered bike lane
- Protected bike lane (i.e. cycle track)
- Shared use path

Attached are the draft cross section and design guidelines cut sheets. Please review and return comments to Alta Planning + Design. Comments and changes will be incorporated and a final document will be produced.

Bicycle Facility Classification

Description

Consistent with bicycle facility classifications throughout the nation, these Facility Design Guidelines identify the following classes of facilities by degree of separation from motor vehicle traffic.

Signed Shared Roadways are bikeways where bicyclists and cars operate within the same travel lane, either side by side or in single file depending on roadway configuration. The most basic type of bikeway is a signed shared roadway. This facility provides continuity with other bicycle facilities (usually bike lanes), or designates preferred routes through high-demand corridors.

Marked Shared Roadways may be designated by pavement markings, signage and other treatments. Shared roadways with low vehicle volumes and speeds either as existing or through interventions are known as bicycle boulevards.

Bicycle Boulevards are applicable on low traffic, low speed streets, and may be supplemented with wayfinding signage, traffic calming and diversion, in addition to incorporating many of the elements of shared roadways.

Bike Lanes use signage and striping to delineate the right-of-way assigned to bicyclists and motorists. Bike lanes encourage predictable movements by both bicyclists and motorists.

Buffered Bike Lanes are similar to bike lanes, but have an added striping buffer between the bike lane and parking, the bike lane and travel lane, or both.

Protected Bike Lanes (i.e. Cycle Tracks) are exclusive bike facilities that combine the user experience of a separated path with the on-street infrastructure of conventional bike lanes. The hallmark of protected bike lanes is physical separation from moving traffic. This separation can come in the form of parked cars, curb barriers, planters, or other types of barrier.

Shared Use Paths are facilities separated from roadways for use by bicyclists, pedestrians, and other non-motorized users.

Marked Shared Roadway

Description

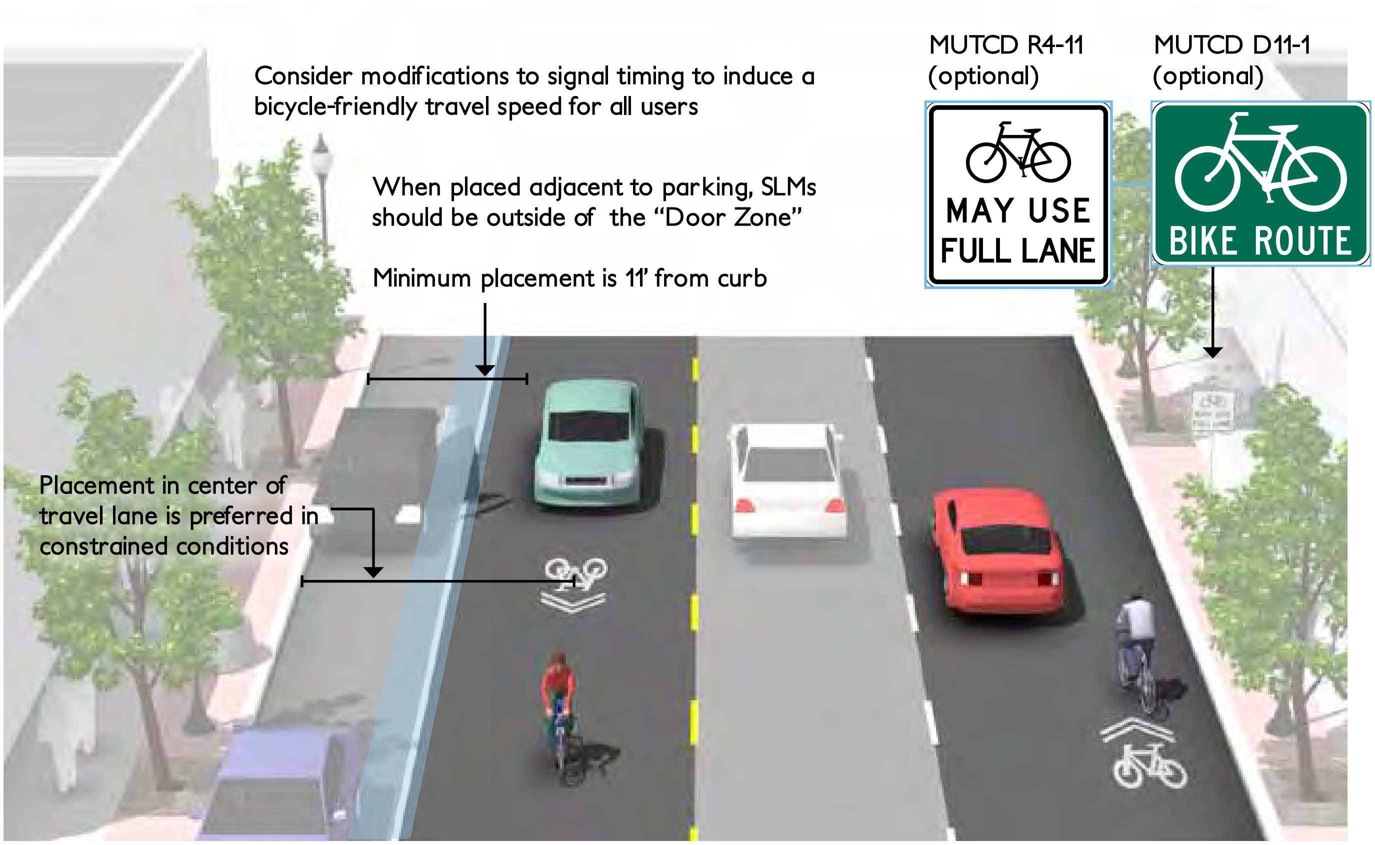
A marked shared roadway is a general purpose travel lane marked with shared lane markings (SLM) used to encourage bicycle travel and proper positioning within the lane.

In constrained conditions, the SLMs are placed in the middle of the lane to discourage unsafe passing by motor vehicles. On a wide outside lane, the SLMs can be used to promote bicycle travel to the right of motor vehicles.

In all conditions, SLMs should be placed outside of the door zone of parked cars.

Guidance

- Do not use on roads with speed limits higher than 35 mph.
- In constrained conditions, preferred placement is in the center of the travel lane to minimize wear and promote single file travel.
- Minimum placement of SLM marking centerline is 11 feet from edge of curb where on-street parking is present, 4 feet from edge of curb with no parking. If parking lane is wider than 7.5 feet, the SLM should be moved further out accordingly.



Discussion

Bike Lanes should be considered on roadways with outside travel lanes wider than 15 feet, or where other lane narrowing or removal strategies may provide adequate road space. SLMs shall not be used on shoulders, in designated bike lanes, or to designate bicycle detection at signalized intersections. (MUTCD 9C.07)

This configuration differs from a bicycle boulevard due to a lack of traffic calming, wayfinding, and other enhancements designed to provide a higher level of comfort for a broad spectrum of users.

Additional References and Guidelines

AASHTO. Guide for the Development of Bicycle Facilities. 2012.
FHWA. Manual on Uniform Traffic Control Devices. 2009.
NACTO. Urban Bikeway Design Guide. 2012.

Materials and Maintenance

Placing SLMs between vehicle tire tracks will increase the life of the markings and minimize the long-term cost of the treatment.

Signed Shared Roadway

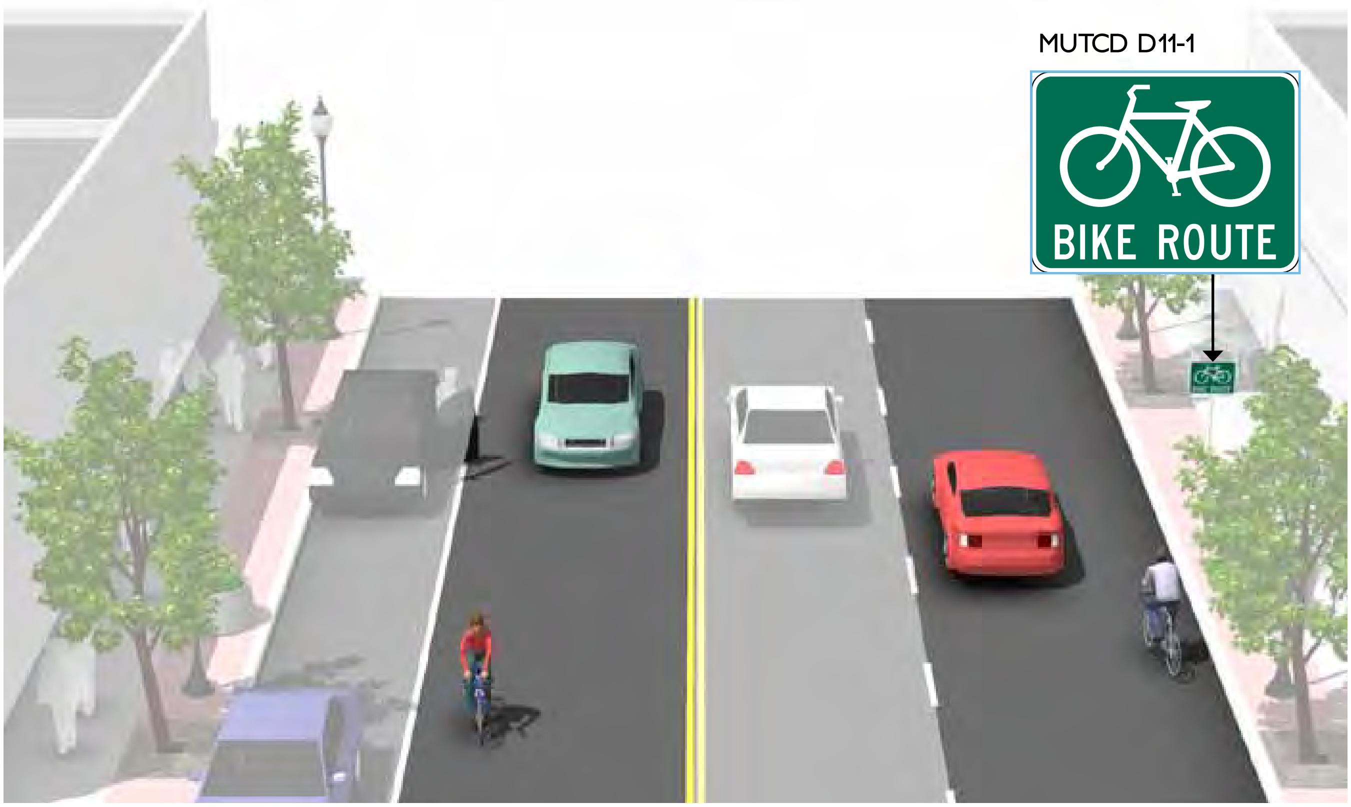
Description

Signed Shared Roadways are facilities shared with motor vehicles. They are typically used on roads with low speeds and traffic volumes, however can be used on higher volume roads with wide outside lanes or shoulders. A motor vehicle driver will usually have to cross over into the adjacent travel lane to pass a bicyclist, unless a wide outside lane or shoulder is provided.

Guidance

Lane width varies depending on roadway configuration. Bicycle Route signage (D11-1) should be applied at intervals frequent enough to keep bicyclists informed of changes in route direction and to remind motorists of the presence of bicyclists. Commonly, this includes placement at:

- Beginning or end of Bicycle Route.
- At major changes in direction or at intersections with other bicycle routes.
- At intervals along bicycle routes not to exceed ½ mile.



Discussion

Signed shared roadways are often used to designate preferred routes through high-demand corridors. If used to provide continuity with other bicycle facilities (such as bike lanes), consider marking the route with shared lane markings to increase legibility for users.

This configuration differs from a bicycle boulevard due to a lack of traffic calming, wayfinding, pavement markings designed to provide a higher level of comfort for a broad spectrum of users.

Additional References and Guidelines

AASHTO. Guide for the Development of Bicycle Facilities. 2012.
FHWA. Manual on Uniform Traffic Control Devices. 2009.

Materials and Maintenance

Maintenance needs for bicycle wayfinding signs are similar to other signs, and will need periodic replacement due to wear.

Bicycle Boulevard

Description

Bicycle boulevards are low-volume, low-speed streets that enhance bicyclist comfort by using treatments such as signage, pavement markings, traffic calming and/or traffic reduction, and intersection modifications. These treatments allow through movements of bicyclists while discouraging similar through-trips by non-local motorized traffic. Many streets will meet speed and volume targets without interventions.

Guidance

- Signs and pavement markings are the minimum treatments necessary to designate a street as a bicycle boulevard.
- Bicycle boulevards should have a maximum posted speed of 25 mph. Use traffic calming to maintain an 85th percentile speed below 22 mph.
- Implement volume control treatments based on the context of the bicycle boulevard, using engineering judgment. Target motor vehicle volumes range from 1,000 to 3,000 vehicles per day.
- Intersection crossings should be designed to enhance safety and minimize delay for bicyclists.

Discussion

Bicycle boulevard retrofits to local streets are typically located on streets without existing signalized accommodation at crossings of collector and arterial roadways. Without treatments for bicyclists, these intersections can become major barriers along the bicycle boulevard and compromise safety.

Traffic calming can deter motorists from driving on a street. Anticipate and monitor vehicle volumes on adjacent streets to determine whether traffic calming results in inappropriate volumes. Traffic calming can be implemented on a trial basis.

Additional References and Guidelines

NACTO. Urban Bikeway Design Guide. 2012.
Ewing, Reid. Traffic Calming: State of the Practice. 1999.
Ewing, Reid and Brown, Steven. U.S. Traffic Calming Manual. 2009.

Materials and Maintenance

Vegetation should be regularly trimmed to maintain visibility and attractiveness.

Bike Lane

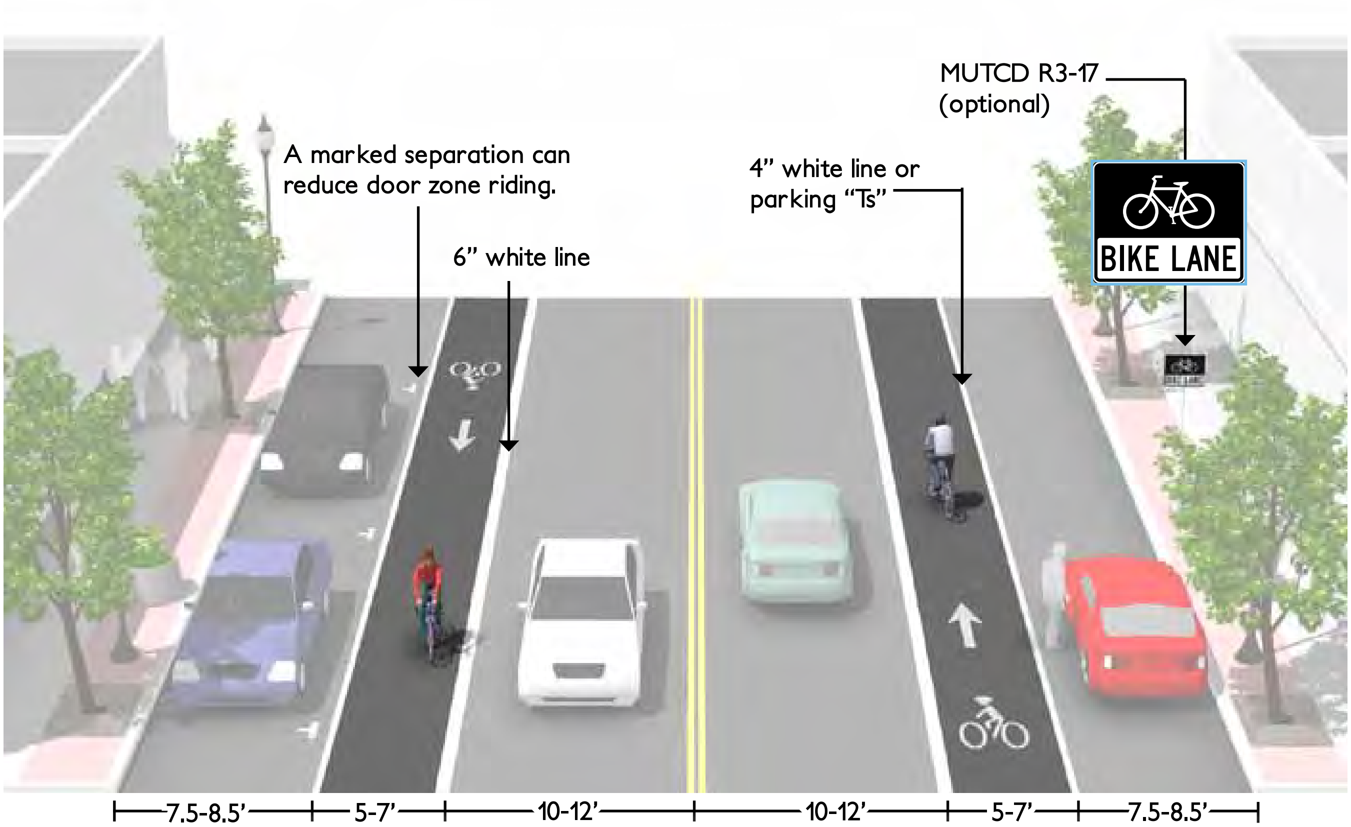
Description

Bike lanes designate an exclusive space for bicyclists through the use of pavement markings and signage. The bike lane is located adjacent to motor vehicle travel lanes and is used in the same direction as motor vehicle traffic. Bike lanes are typically on the right side of the street, between the adjacent travel lane and curb, road edge or parking lane.

Many bicyclists, particularly less experienced riders, are more comfortable riding on a busy street if it has a striped and signed bikeway than if they are expected to share a lane with vehicles.

Guidance

- Bike lanes may range from 4-6' wide if they are placed adjacent to the curb and parking is not allowed.
- 7 foot maximum for marked width of bike lane. Greater widths may encourage vehicle loading in bike lane. Consider buffered bicycle lanes when a wider facility is desired.
- Consider a buffered bike lane in areas with high parking turnover.



Discussion

Bike lanes adjacent to on-street parallel parking require special treatment in order to avoid crashes caused by an open vehicle door. The bike lane should have sufficient width to allow bicyclists to stay out of the door zone while not encroaching into the adjacent vehicular lane. Parking stall markings, such as parking "Ts" and double white lines create a parking side buffer that encourages bicyclists to ride farther away from the door zone.

Additional References and Guidelines

AASHTO. Guide for the Development of Bicycle Facilities. 2012.
FHWA. Manual on Uniform Traffic Control Devices. 2009.
NACTO. Urban Bikeway Design Guide. 2012.

Materials and Maintenance

Paint can wear more quickly in high traffic areas or in winter climates. Bicycle lanes should be cleared of snow through routine snow removal operations.

Buffered Bike Lane

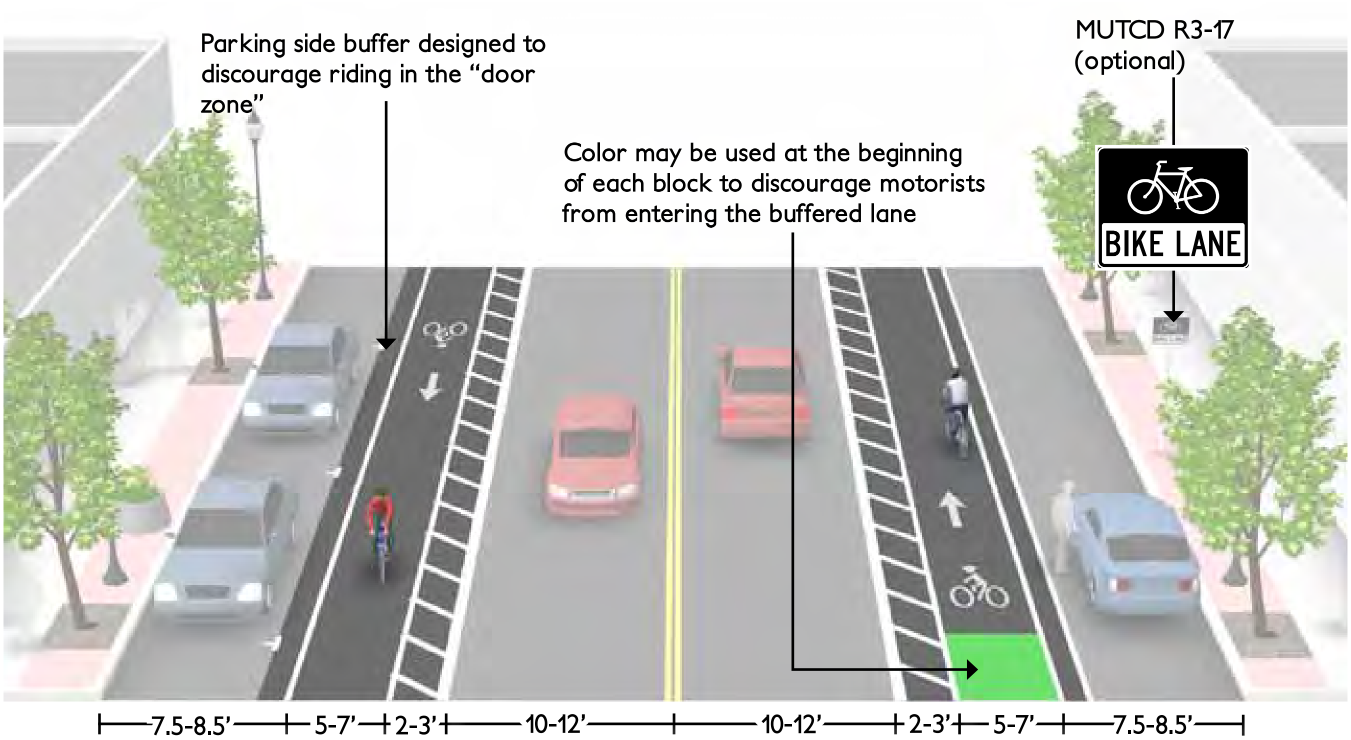
Description

Buffered bike lanes are conventional bicycle lanes paired with a designated buffer space, separating the bicycle lane from the adjacent motor vehicle travel lane and/or parking lane. Buffered bike lanes follow MUTCD guidelines for buffered preferential lanes (section 3D-01).

Buffered bike lanes are designed to increase the space between the bike lane and the travel lane or parked cars. This treatment is appropriate for bike lanes on roadways with high motor vehicle traffic volumes and speed, adjacent to parking lanes, or a high volume of truck or oversized vehicle traffic.

Guidance

- Where bicyclist volumes are high or where bicyclist speed differentials are significant, the desired bicycle travel area width is 7 feet.
- Buffers should be at least 2 feet wide. If 3 feet or wider, mark with diagonal or chevron hatching. For clarity at driveways or minor street crossings, consider a dotted line for the inside buffer boundary where cars are expected to cross.
- Diagonal hatching should be striped at intervals of 10 to 40 feet. Increased striping frequency may increase motorist compliance.



Discussion

Frequency of right turns by motor vehicles at major intersections should determine whether continuous or truncated buffer striping should be used approaching the intersection.

Parking side buffers are helpful in areas with high turnover parking to reduce the risk of dooring.

Additional References and Guidelines

AASHTO. Guide for the Development of Bicycle Facilities. 2012.
FHWA. Manual on Uniform Traffic Control Devices. 2009. (3D-01)
NACTO. Urban Bikeway Design Guide. 2012.

Materials and Maintenance

Paint can wear more quickly in high traffic areas or in winter climates. Bicycle lanes should be cleared of snow through routine snow removal operations.

Protected Bike Lanes (i.e. Cycle Tracks)

Description

A cycle track is an exclusive bike facility that combines the user experience of a separated path with the on-street infrastructure of a conventional bike lane. A cycle track is physically separated from motor traffic and distinct from the sidewalk. Cycle tracks have different forms but all share common elements—they provide space that is intended to be exclusively or primarily used by bicycles, and are separated from motor vehicle travel lanes, parking lanes, and sidewalks.
Raised cycle tracks may be at the level of the adjacent sidewalk or set at an intermediate level between the roadway and sidewalk to separate the cycle track from the pedestrian area.

Guidance

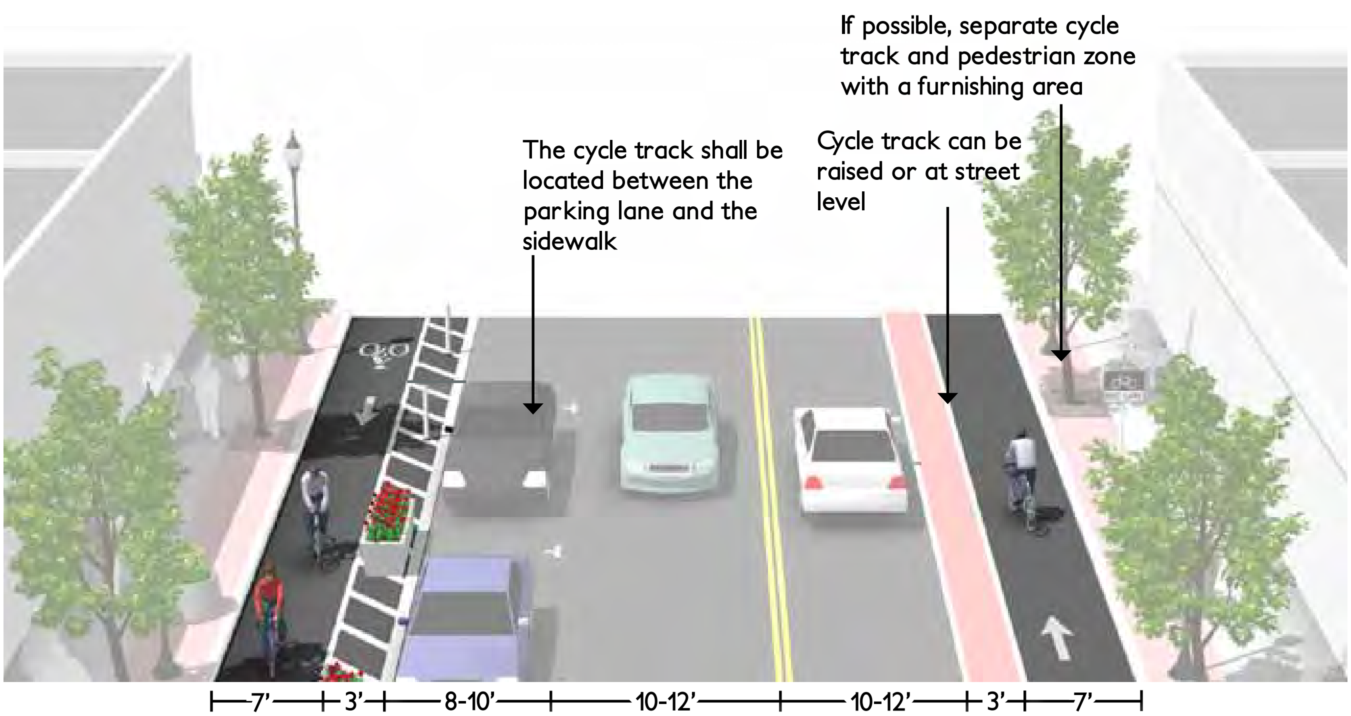
Cycle tracks should ideally be placed along streets with long blocks and few driveways or mid-block access points for motor vehicles.

One-Way Cycle Tracks

- 7 foot recommended minimum to allow passing. 5 foot minimum in constrained locations.

Two-Way Cycle Tracks

- Cycle tracks located on one-way streets have fewer potential conflict areas than those on two-way streets.
- 12 foot recommended minimum for two-way facility. 8 foot minimum in constrained locations



Discussion

Special consideration should be given at transit stops to manage bicycle and pedestrian interactions. Driveways and minor street crossings are unique challenges to cycle track design. Parking should be prohibited within 30 feet of the intersection to improve visibility. Color, yield markings and "Yield to Bikes" signage should be used to identify the conflict area and make it clear that the cycle track has priority over entering and exiting traffic. If configured as a raised cycle track, the crossing should be raised so that the sidewalk and cycle track maintain their elevation through the crossing.

Additional References and Guidelines

NACTO. Urban Bikeway Design Guide. 2012.

Materials and Maintenance

In cities with winter climates, barrier separated and raised cycle tracks may require special equipment for snow removal.

Shared Use Paths

Description

Shared use paths can provide a desirable facility, particularly for recreation, and users of all skill levels preferring separation from traffic. Paths should generally provide directional travel opportunities not provided by existing roadways.

Guidance

Width

- 8 feet is the minimum allowed for a two-way path and is only recommended for low traffic situations. 10 feet is recommended in most situations and will be adequate for moderate to heavy use.
- 12 feet is recommended for heavy use situations with high concentrations of multiple users. A separate track (5 foot minimum) can be provided for pedestrian use.

Lateral Clearance

- A 2 foot or greater shoulder on both sides of the path should be provided. An additional foot of lateral clearance (total of 3 feet) is required by the MUTCD for the installation of signage or other furnishings.
- If bollards are used at intersections and access points, they should be colored brightly and/or supplemented with reflective materials to be visible at night.

Overhead Clearance

- Clearance to overhead obstructions should be 8 feet minimum, with 10 feet recommended.

Striping

When striping is desired, use a 4 inch dashed yellow centerline stripe with 4 inch solid white edge lines. Solid centerlines can be provided on tight or blind corners, and on the approaches to roadway crossings.

Terminate the path where it is easily accessible to and from the street system, preferably at a controlled intersection or at the beginning of a dead-end street.

Discussion

The AASHTO Guide for the Development of Bicycle Facilities generally recommends against the development of shared use paths along roadways unless they are limited-access roads (such as freeways or other expressways). Also known as "sidepaths", these facilities create a situation where a portion of the bicycle traffic rides against the normal flow of motor vehicle traffic and can result in wrong-way riding when either entering or exiting the path.

Additional References and Guidelines

AASHTO. Guide for the Development of Bicycle Facilities. 2012.
FHWA. Manual on Uniform Traffic Control Devices. 2009.
Flink, C. Greenways: A Guide To Planning Design And Development. 1993.

Materials and Maintenance

Asphalt is the most common surface for bicycle paths. The use of concrete for paths has proven to be more durable over the long term. Saw cut concrete joints rather than troweled improve the experience of path users.

Bicycle Facility Continua

The following continua illustrate the range of bicycle facilities applicable to various roadway environments, based on the roadway type and desired degree of separation. Engineering judgment, traffic studies, previous municipal planning efforts, community input and local context should be used to refine criteria when developing bicycle facility recommendations for a particular street. In some corridors, it may be desirable to construct facilities to a higher level of treatment than those recommended in relevant planning documents in order to enhance user safety and comfort. In other cases, existing and/or future motor vehicle speeds and volumes may not justify the recommended level of separation, and a less intensive treatment may be acceptable.

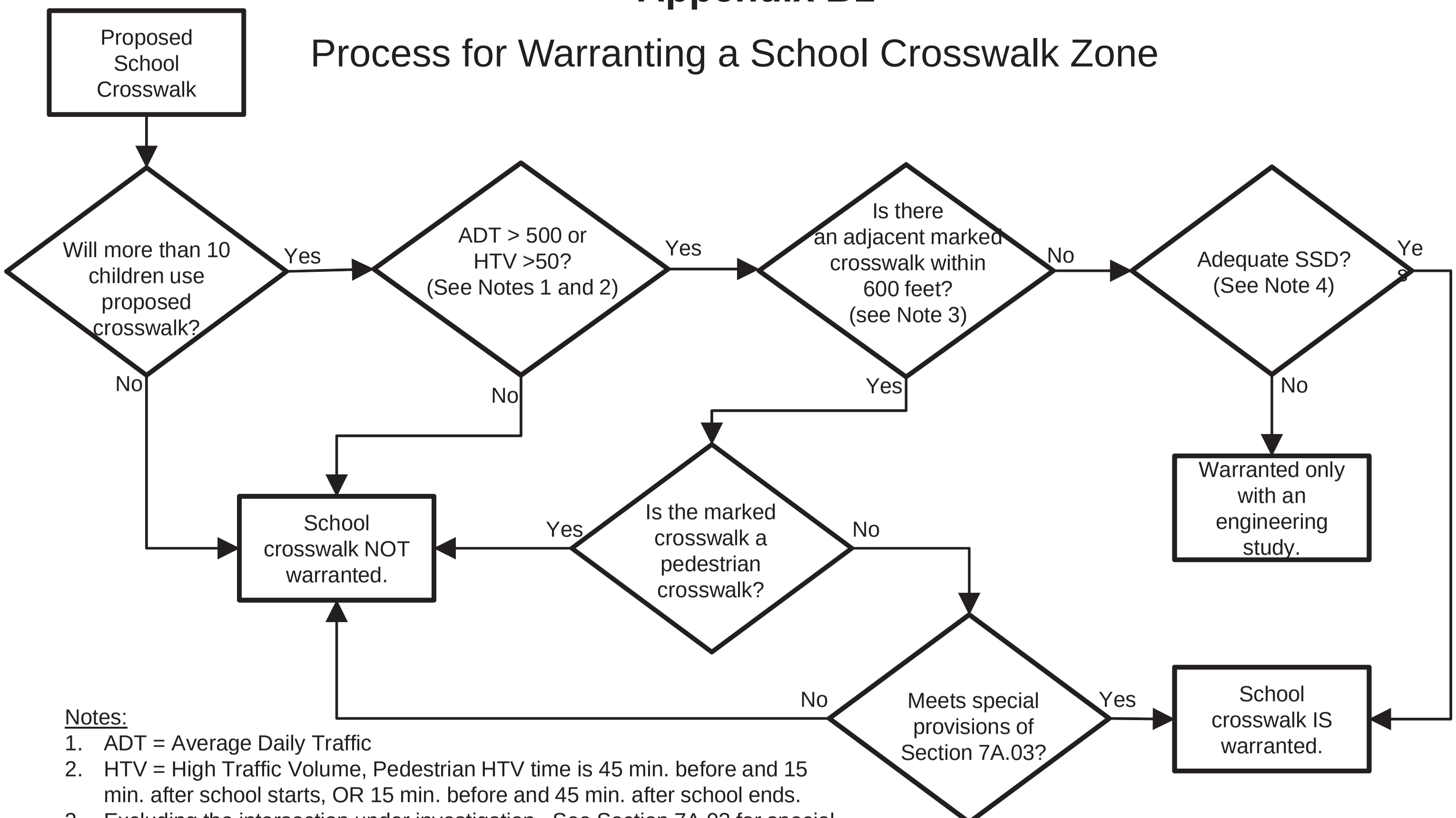
Least Protected → Most Protected

Signed Shared Roadway	Marked Shared Roadway	Bike Lane	Buffered Bike Lane	Protected Bike Lane: parking protected and at-grade	Protected Bike Lane: protected with barrier	Protected Bike Lane: curb separated	Shared Use Path

Appendix F: Utah MUTCD Warrant Flowcharts

Appendix B1

Process for Warranting a School Crosswalk Zone



<u>Notes:</u>

1. ADT = Average Daily Traffic
2. HTV = High Traffic Volume, Pedestrian HTV time is 45 min. before and 15 min. after school starts, OR 15 min. before and 45 min. after school ends.
3. Excluding the intersection under investigation. See Section 7A.03 for special provisions of secondary school crosswalk..
4. SSD = Stopping Site Distance
5. Only one school crosswalk should cross the major roadway.

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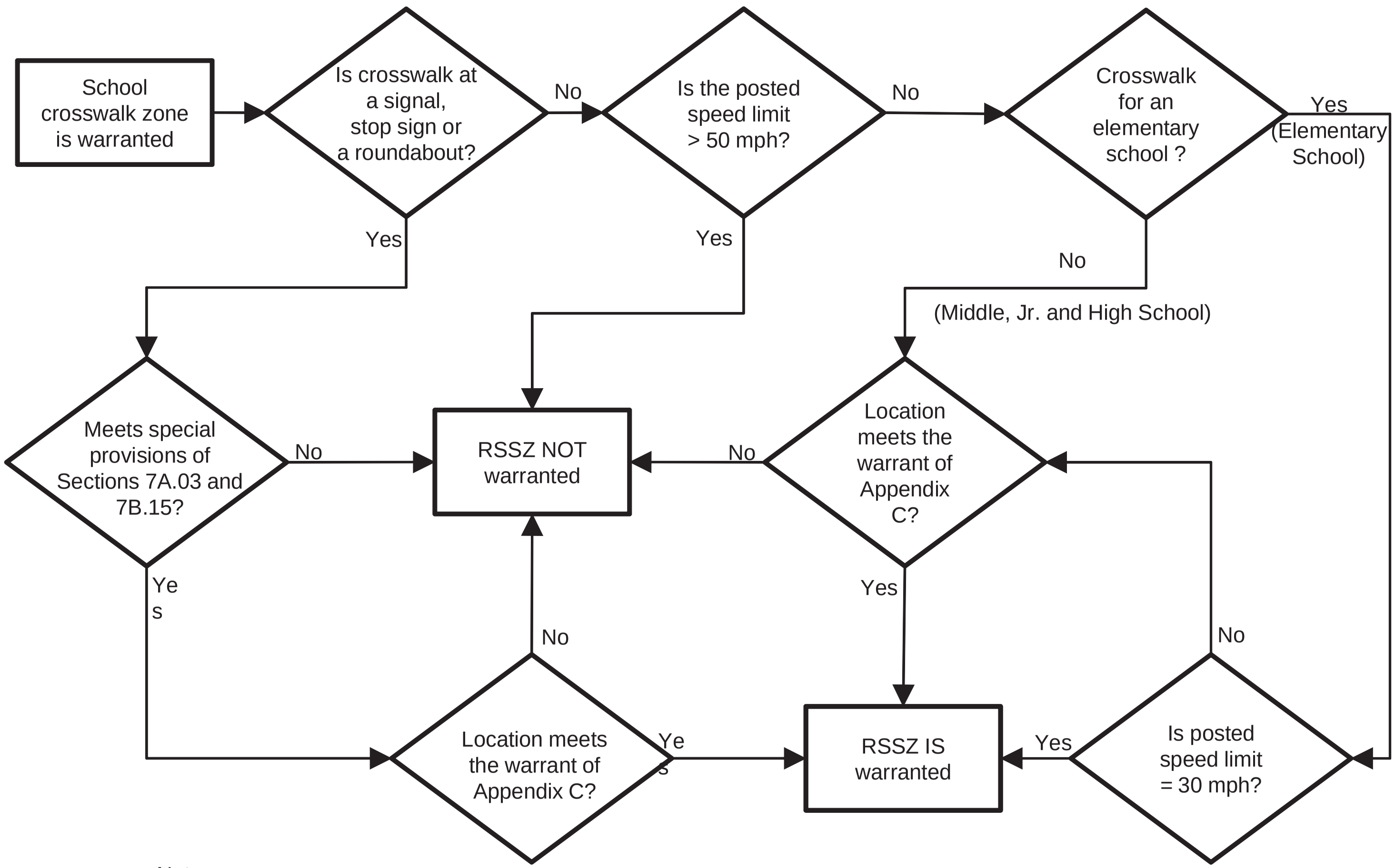
Appendix B2

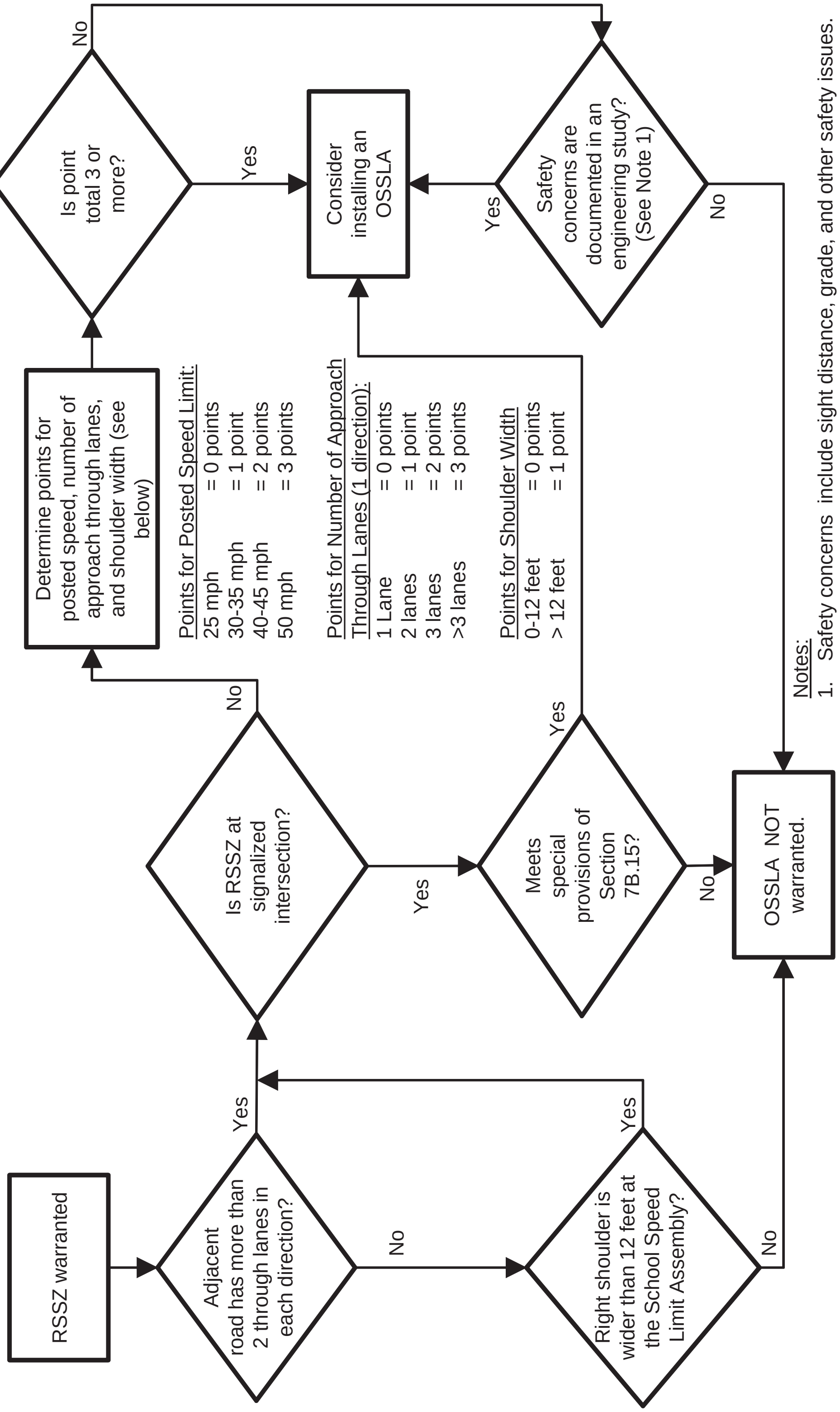
Process for Warranting a Reduced Speed School Zone (RSSZ)



Notes:
1. See Appendix B4 for crossing guard requirements.

Appendix B3

Requirements for Consideration of Overhead School Speed Limit Assembly (OSSLA) in a Reduced Speed School Zone (RSSZ)



Notes:
1. Safety concerns include sight distance, grade, and other safety issues.

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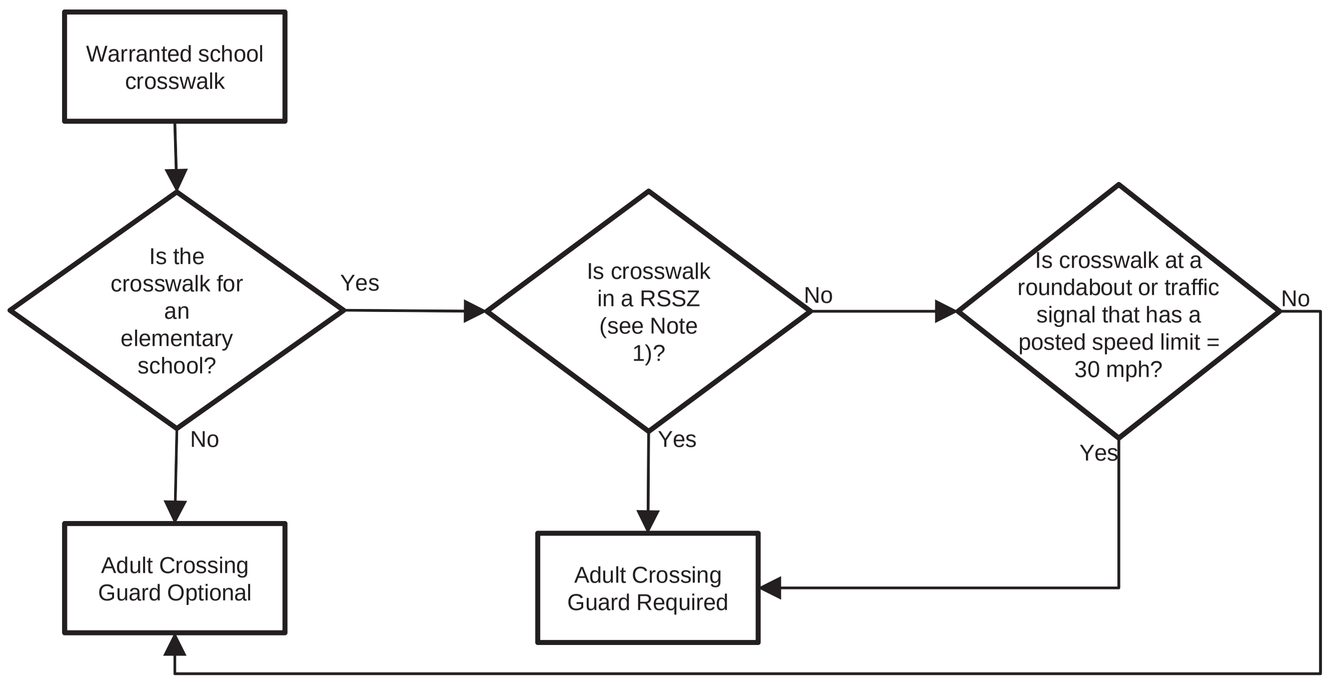
Appendix B4

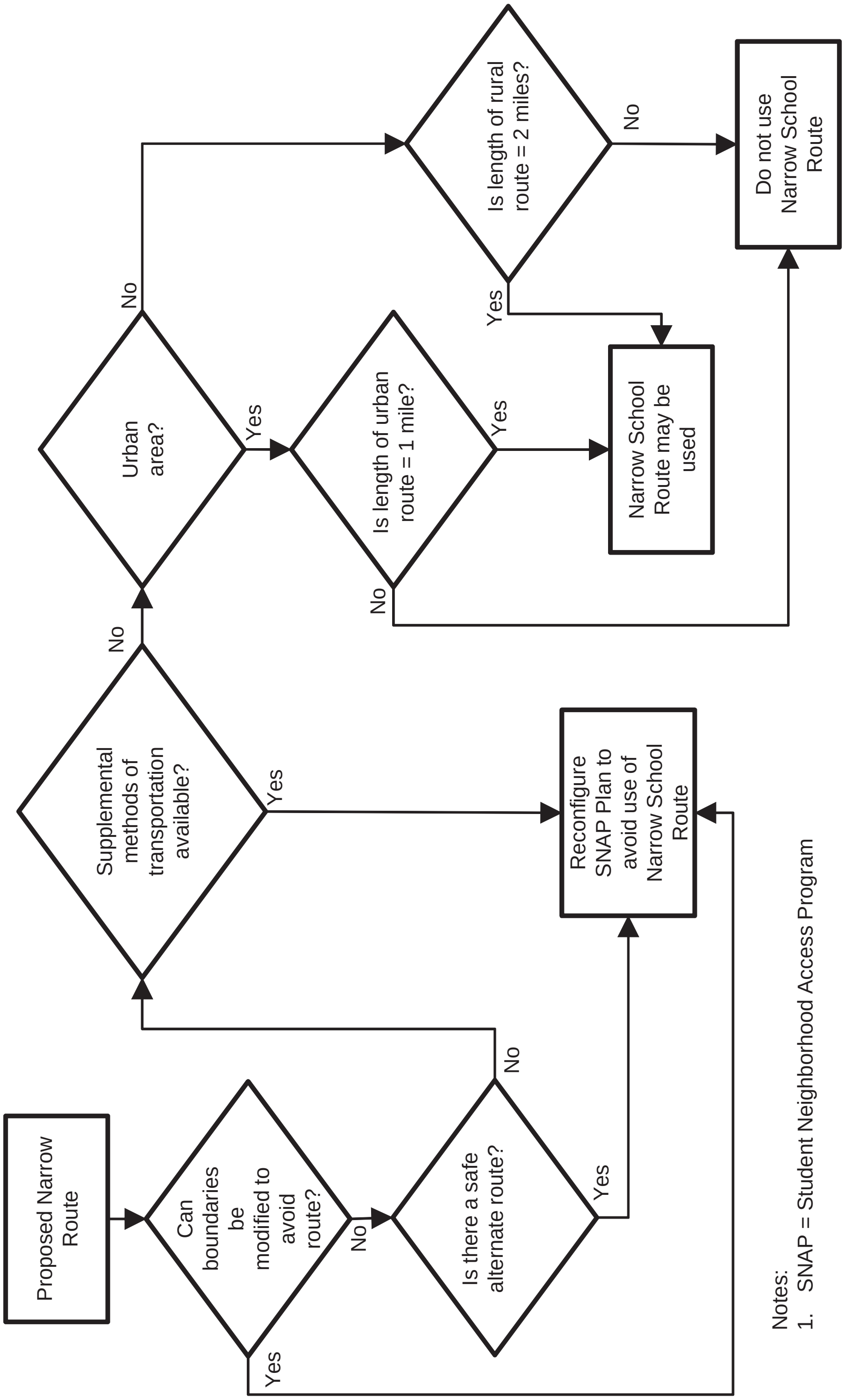
Requirements for Adult Crossing Guards at School Crosswalks



Note:
1. RSSZ = Reduced Speed School Zone

Appendix B5

Process for Evaluating the Use of a Narrow School Route



Notes:
1. SNAP = Student Neighborhood Access Program

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Appendix G: Traffic Calming Program

LAYTON CITY

TRAFFIC CALMING GUIDELINES

ADOPTED 2015

PREPARED BY

HORROCKS ENGINEERS

CONTENTS

INTRODUCTION

The concept of traffic calming originated in the 1960s with the publication of ***Traffic in Towns*** by Sir Colin Buchanan. This volume described the potential damages to society and neighborhood livability caused by the motor car and methods to mitigate these impacts. These policies helped shape the development of urban landscape in many countries over the next few decades.

Since the mid 1990s, the Institute of Transportation Engineers (ITE) has seen traffic calming as an institute priority and the industry at large has seen dozens of programs implemented to address the issue of traffic calming. In 1999, ITE, along with the Federal Highway Administration (FHWA), published: ***Traffic Calming: State of the Practice***. This became the authority of traffic calming methods and practices. A second, more recent publication: ***U.S. Traffic Calming Manual****,* was released in 2009 by the American Society of Civil Engineers (ASCE) and the American Planning Association (APA) as a companion volume to ***Traffic Calming: State of the Practice***.

Today, traffic calming programs have been adopted by agencies throughout the United States, as it has become increasingly important to the public, agencies and other interested parties to develop effective neighborhood environments that adequately accommodate motor vehicles, pedestrians and bicyclists. Layton City is interested in applying appropriate traffic calming with the goals of improving neighborhood *safety* and *livability* while maintaining traffic circulation and overall user *mobility.*

ITE defines traffic calming as follows:

> *Traffic calming involves changes in street alignment, installation of barriers, and other physical measures to reduce traffic speeds and / or cut-through volumes, in the interest of street safety, livability, and other public purposes.*

Based on ITE's definition, traffic calming is a methodology to influence motorist behavior and prevent undesirable driving practices. Traffic calming is generally achieved with physical measures that reduce speeds, reduce traffic volumes, discourage cut-through traffic on local streets, minimize conflicts between street users, and enhance the environment.

This document presents recommended traffic calming guidelines for use within Layton City. The guidelines are applicable for use on existing streets, as well as in new developments. This document presents a comprehensive program for addressing the traffic calming needs of the City, including responding to citizen requests, prioritizing traffic calming needs, selecting the most appropriate type of traffic calming, installing traffic calming measures, and evaluating the effectiveness of traffic calming already in use.

An extensive literary search was conducted of the state-of-the-practice by other agencies and organizations to gather information on the best practices for designing neighborhood traffic calming programs. This information was utilized to develop guidelines for Layton City.

PRINCIPLES OF TRAFFIC CALMING

There are several principles of traffic calming that should be considered when implementing traffic calming measures. The following principles are intended to provide guidance and direction for users of this document:

1.0 PROBLEM IDENTIFICATION

Identifying the real traffic problem for a neighborhood roadway is not a simple process. Sometimes the perceived nature of a traffic problem is very different from the real problem. For example, residents often mention both “traffic volume” and “speeding” as problems on their streets, but in many cases the traffic problem is one or the other. It is important to identify the real traffic problem in order to select the appropriate mitigating measure.

1.1 PROBLEM CHARACTERIZATION

In order to ensure that the appropriate traffic calming measures are implemented, it is essential that the extent of problems be characterized and quantified. Roadway information such as width of roadway and intersection dimensions should be collected. Diagrams can also be made to show such items as traffic volumes, speeds, peak hours of travel, turning movement counts, historical crash information, transit routes, bicycle routes, and pedestrian volumes.

1.2 CONSIDER MAJOR ROAD NETWORK IMPROVEMENTS

Before implementing any traffic calming measures for unwanted through traffic on neighborhood roadways, the reason for these movements need to be determined. Sometimes congestion on adjacent arterials encourages motorists to use residential streets as a shortcut. There are a wide range of low-cost options available to improve operations on the major street network, including fine-tuning signal timings, adding turn pockets, and implementing prohibitions and parking restrictions.

1.3 MINIMIZE ACCESS RESTRICTIONS

Residents, businesses, and others who live and work in the community will be more supportive of traffic calming measures that do not restrict their access into and out of a neighborhood. Problems should be addressed with other less restrictive traffic calming measures when possible.

1.4 TARGET PASSENGER VEHICLES

The purpose in implementing traffic calming measures is to minimize impacts to other modes of transportation such as transit, pedestrian and bikes. Designs for traffic calming measures should take into account these modes of transportation.

1.5 TEMPORARY IMPLEMENTATION

When possible, inexpensive temporary measures should be installed to ensure traffic calming measures will achieve the intended results prior to constructing permanent measures. A temporary installation also provides an opportunity to alter the geometrics of a measure or make other changes prior to permanent installation. Temporary measures should resemble permanent measures as much as possible.

1.6 NEIGHBORHOOD INVOLVEMENT

Residents, businesses and others who live and work in the community should be involved in developing traffic calming. Their input is essential in identifying problems and in selecting traffic calming solutions. Involving the neighborhood builds support for traffic calming plans, and enhances the credibility and effectiveness of a plan.

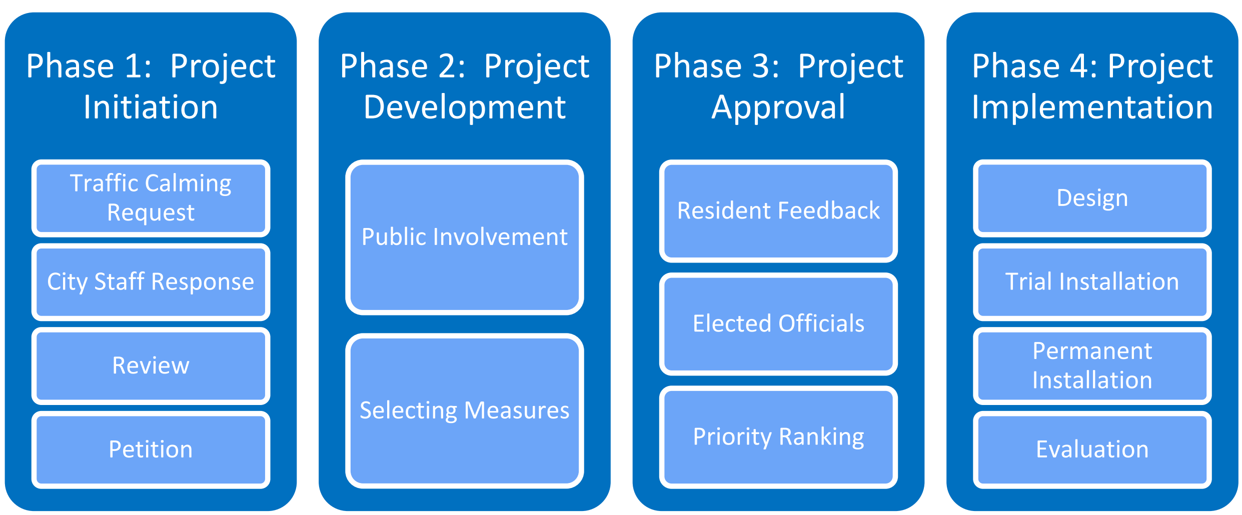
1.7 MONITOR CONDITIONS

Traffic patterns change and consequently it is important that traffic volumes, vehicle speeds, crashes, and other indicators of potential traffic problems are recorded and analyzed continually. Much of this information is already collected and can be stored in a Geographic Information System (GIS) or other easy to manage database. City personnel should monitor conditions on a continual basis.

2.0 TRAFFIC CALMING PROCESS

A successful traffic calming program consists of four phases: project initiation, project development, project approval, and project implementation. Each phase has several tasks associated with it. This section describes the steps in the process of implementing traffic calming in new developments and existing neighborhoods. **FIGURE 1** presents the typical traffic calming process and are described in the following sections.

Figure 1: Traffic Calming Process



2.1 PROJECT INITIATION

The first phase in the traffic calming process is project initiation. This phase begins when a resident, business owner, neighborhood group, or proactive Layton City employee identifies a potential problem area.

TRAFFIC CALMING REQUEST

Upon identifying a potential traffic problem, the concerned party then submits a formal request for traffic calming. This request can come from any concerned individual or group who sees a possible need for traffic calming.

For new developments, Layton City will review development plans to identify potential traffic problems such as speeding or cut-through traffic. Often traffic problems can be predicted and prevented by properly reviewing roadway and lot plans for new developments.

For existing neighborhoods, the concerned party should make their concern known to the Layton City Engineering Department. The concerned party should identify the location and exact nature of their primary concern such as vehicle safety, pedestrian safety, congestion, speeding, noise, or cut-through traffic. This information should be submitted in written form via the **REQUEST FOR TRAFFIC CALMING FORM** found in **APPENDIX I,** available from the City Engineering Department or accessible via download from the City's website. Requests may also be made via the City's website.

CITY STAFF RESPONSE

Upon receipt of a traffic calming request, Layton City staff will have 30 days to respond to the applicant. During this time staff will identify the problem area and whether a request has already been previously submitted for the request location. If this is the case, the applicant will be notified that a study is already underway and will be put in contact with the previous applicant upon their authorization.

REVIEW

If no study is currently in process, staff will identify the limits of the study and the eligibility of the roadway for traffic calming. The **STUDY AREA** should include all streets that may be affected by traffic calming treatments and should generally be bounded by features such as roadways, topography or land use changes. The process of determining eligibility will include a review of the roadway functional type as well as meetings with key stakeholders within the City. Key stakeholders may include but not be limited to the following:

Mayor
City Council
Emergency Response Personnel
City Administrator
Streets Superintendent
Public Works Director

Police and Fire Chief
Bike & Pedestrian Coordinator
City Engineer

PETITION

2.2 UPON NOTIFICATION OF THE STUDY AREA AND DETERMINATION THAT THE ROADWAY IS ELIGIBLE FOR TRAFFIC CALMING, THE APPLICANT MUST DISTRIBUTE A **petition** TO THE RESIDENTS/PROPERTY OWNERS IN THE STUDY AREA FOR SUPPORT OF THE TRAFFIC CALMING REQUEST. AT LEAST **50%** OF THE RESIDENTS/PROPERTY OWNERS IN THE STUDY AREA MUST SIGN THE PETITION IN ORDER FOR LAYTON CITY TO PROCEED WITH THE TRAFFIC CALMING PROCESS. PROJECT DEVELOPMENT

Once a request passes through phase 1 and is deemed suitable for traffic calming based on the criteria outlined, staff begins the process of selecting an appropriate traffic calming measure in corporation with the community. It is at this stage in the process where budget and resource restraints are identified.

PUBLIC INVOLVEMENT

Early in the project development phase Layton City will hold a widely advertised public meeting. At this meeting, staff will present the process used to develop, approve, and implement neighborhood traffic calming plans. The public is encouraged to identify and discuss the traffic problems in the study area. Staff should provide a brief tutorial on traffic calming and encourage the residents to volunteer for the **COMMUNITY TRAFFIC COMMITTEE (CTC)** and select a **NEIGHBORHOOD REPRESENTATIVE.** The CTC should consist of residents and business owners residing in the immediate vicinity of the study area as well as any surrounding affected areas. The neighborhood representative may or may not be the original applicant. City staff act as technical advisors to the CTC throughout the process. The CTC is essential to the process as they provide a contact for feedback to the City and can aid in data collection and public involvement. Data should be collected regarding traffic volume, roadway geometry, speeds, crashes, neighborhood comments, etc.

SELECTING MEASURES

Based on the character of the traffic problem and the data that has been collected, the City will develop possible traffic calming solutions. The solutions shall be evaluated to determine if they meet the required goals and objectives.

Once the measures have been selected they should be discussed with the CTC to solicit feedback and address any concerns or comments from the community. At this point a preferred alternative should be selected by City staff and the CTC.

2.3 PROJECT APPROVAL

Once a preferred alternative has been selected by City staff and the CTC it must be presented to the affected residents and approved by elected officials.

RESIDENT FEEDBACK

A public meeting will be held by the CTC where the preferred alternative is presented to the neighborhood residents and all other interested parties. A standard drawing design of the proposed traffic calming measure as well as maps showing the approximate location of the preferred alternative may be presented. The CTC with the help of the technical advisors should respond to questions and concerns from the general public at this time. Any concerns should be taken into consideration before proceeding to the next step.

ELECTED OFFICIALS

Once a final solution has been developed, the traffic calming measures will be presented to the key City stakeholders for their final input before it is presented to the City Council. **THE APPROVAL OF TRAFFIC CALMING MEASURES IS ULTIMATELY UP TO THE CITY ENGINEER AND CITY COUNCIL.** As part of the solution, a plan should also be included for implementation of the traffic calming measure. The plan should detail the design and construction costs.

PRIORITY RANKING

Due to budget planning, a priority ranking of the particular project may be performed. Founded on a point system, the solution will receive points based on various data including speed, volume, crash data, pedestrian use, and proximity to schools, hospitals, and care facilities. Projects requiring funding will be prioritized in the next fiscal year budget and only those projects with sufficiently high rankings will be implemented.

Costs can also be shared with the neighborhood. For instance, if a community requests a speed hump, which is then approved by City staff, yet it is of low priority, the community can share the burden of the cost in order for the construction to go forward. Costs not only include construction but also maintenance of landscaping. Costs shall be discussed as part of a public meeting.

2.4 PROJECT IMPLEMENTATION

Project implementation is the final phase in the traffic calming process. After the city council has approved and funding has been allocated either by the City Council or cost sharing with the neighborhood, the plan to implement the traffic calming measure can be put in place.

DESIGN

Using the guidelines discussed in this documents companion volume **LAYTON CITY – TRAFFIC CALMING TOOLBOX,** the selected traffic calming measure will be designed. The final design will be in accordance to the guidelines (e.g. geometric, landscaping, safety, etc.) presented in said document.

TRIAL INSTALLATION

At the discretion of Layton City, a temporary traffic calming measure that closely resembles the proposed solution may be installed to evaluate the potential effectiveness of the permanent measure. Trial installations should be evaluated after a minimum of 6 months of operation.

PERMANENT INSTALLATION

Once the decision has been made by Layton City to proceed with permanent installation of the traffic calming measure, construction will be scheduled and will commence according to the schedule and funding restrictions decided by the City Council. Care must be taken that permanent installations will be effective and are supported by the community.

EVALUATION

If after evaluation of the temporary measure, the desired results are not achieved, the permanent traffic calming measure may not be installed and the process should return to the project development phase. Each project will be eligible for a return to the project development phase one time only.

3.0 TRAFFIC CALMING MEASURES

This section introduces the six main categories of traffic calming measures and presents their studied effectiveness at mitigating traffic problems. For a more detailed description of each of the measures listed, please see the companion document **LAYTON CITY – TRAFFIC CALMING TOOLBOX.**

3.1 NON-PHYSICAL MEASURES

Non-Physical Measures are measures such as signage or speed enforcement that do not require any construction or physical modifications to the roadway. These items can be attempted first since they can be economical and easy to remove if they do not solve the problem.

3.1.1 Effectiveness of Non-Physical Measures

Some measures such as speed enforcement signs or trailers have temporary effectiveness. Other measures have inconclusive effectiveness and may not significantly reduce speeds.

3.1.2 Specific Non-Physical Measures

- Speed Enforcement
- Radar Speed Signs
- Lane Striping
- Signage
- Speed Legends
- Raised Pavement Markings

- Angled Parking

3.2 VOLUME CONTROL MEASURES

Volume Control Measures reduce the quantity of vehicles that use the roadway. They use barriers to restrict one or more movements at an intersection. Their primary purpose is to divert traffic away from the trouble area thus reducing cut-through traffic.

3.2.1 Effectiveness of Volume Control Measures

Volume control measures are effective in reducing traffic volume by 30-40%. They have also been found to reduce travel speeds by up to 19%.

3.2.2 Specific Volume Control Measures

- Full Closure
- Half Closure
- Diagonal Diverter
- Median Barrier
- Forced Turn Island

3.3 VERTICAL SPEED CONTROL MEASURES

Vertical Speed Control Measures are usually raised segments of the roadway that vary in height and width. These are designed to force a vehicle to slow down in order to comfortably navigate them.

3.3.1 Effectiveness of Vertical Speed Control Measures

Vertical speed control measures can reduce traffic volumes up to 22% and speeds up to 25%.

3.3.2 Specific Vertical Speed Control Measures

- Speed Hump
- Speed Lump
- Speed Table
- Raised Crosswalk
- Raised Intersection

3.4 HORIZONTAL SPEED CONTROL MEASURES

Horizontal Speed Control Measures are segments of roadway where the straight line of travel has been altered to cause a vehicle to change direction and slow down.

3.4.1 Effectiveness of Horizontal Speed Control Measures

Horizontal speed control measures may reduce traffic volumes as much as 20% and vehicle speeds up to 14%.

3.4.2 Specific Horizontal Speed Control Measures

- Traffic Circle
- Roundabout
- Chicane
- Lateral Shift

3.5 NARROWING MEASURES

Narrowing Measures are usually short segments of the roadway that have been narrowed to restrict the pavement surface.

3.5.1 Effectiveness of Narrowing Measures

Narrowings have been found to result in an approximate 4% decrease in travel speed and a 10% decrease in traffic volume.

3.5.2 Specific Narrowing Measures

- Neckdown
- Choker
- Center Island

3.6 COMBINED MEASURES

Sometimes one traffic calming measure may not sufficiently address specific traffic problems like excess speeding. Combined Measures are a combination of two or more of the previously mentioned measures that are installed concurrently to accomplish the design goals.

APPENDIX I: PROCESS DOCUMENTATION

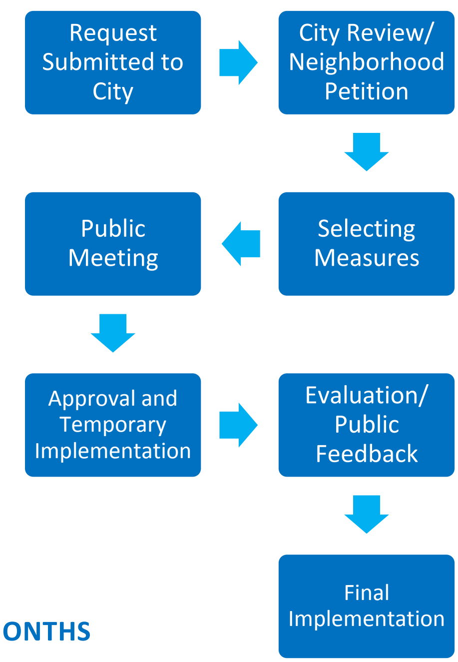
TRAFFIC CALMING PROGRAM INSTRUCTIONS

1 INTRODUCTION

Welcome to the Layton City traffic calming program! These instructions outline the steps in the traffic calming request process. Please read and understand these instructions before filling out the Request for Traffic Calming form or Petition.

2 IMPLEMENTATION PROCESS/TIME FRAME

The implementation process and time frame depend on the number of traffic calming requests running concurrently and the complexity of the traffic analyses. The time frames shown here represent the estimated maximum time taken from neighborhood request to installation. Layton City will accept traffic calming requests at any time throughout the year. Requests will be processed in the order they are received. However, in order for traffic calming measures to be properly budgeted the timeframe from petition to project implementation may vary.



Request submitted in person or online.

City to accept and review request:	1 month
Petitioner completes petition:	2 months
City reviews petition and confirm signatures:	2 months
City accepts petition and performs traffic study:	4 months
City presents calming options to neighborhood and presents recommendations to City Council:	4 months
Temporary measures installed:	*3-5 months
Permanent installation if temporary measures are deemed effective:	*2-6 months

POSSIBLE TOTAL TIME FRAME: 18-24 MONTHS

**Some traffic calming measures may be beyond the budget of the traffic calming program and require the project to be added to the Capital Improvement Program (CIP). This could extend the project timeline by 12 months in order to be considered in the next fiscal year's CIP funding.*

3 TRAFFIC CALMING REQUEST

3.1 ESTABLISHING A NEIGHBORHOOD REPRESENTATIVE

Communication with the City will be through a "Neighborhood Representative" and neighborhood meetings.

The neighborhood representative **MUST BE A HOME OWNER, 18 YEARS OF AGE OR OLDER, LIVING ON THE STREET WHERE TRAFFIC CALMING IS BEING REQUESTED.** Endorsement from other neighborhood residents is NOT required for someone to initiate a traffic calming request and become the neighborhood representative. The neighborhood representative fills out the **REQUEST FOR TRAFFIC CALMING** form and will work with his/her neighbors to sign the **LAYTON CITY TRAFFIC CALMING PETITION.**

3.2 REQUEST FOR TRAFFIC CALMING

The **REQUEST FOR TRAFFIC CALMING** form (request form) establishes communication between the City and the neighborhood representative. The request form is to be completed by the neighborhood representative and needs to be filled out completely in order for the City to review it. Please attach any other supporting pictures and/or drawings as needed to explain your traffic calming request. Written forms should be returned to the Layton City Engineering Department at:

Layton CIty Engineering
1450 West 550 North
Layton, Utah 84057

3.3 MINIMUM QUALIFYING CRITERIA

Once the request form is completed and submitted to the City, the City will confirm that the request meets the following minimum criteria:

a. The study street is classified as a neighborhood street by Layton City.
b. The roadway must front residential, park, and/or schools over 66% of its length.
c. The posted speed limit does not exceed 25 mph.
d. The street is **NOT** a major emergency response route as determined by emergency response agencies and the City.
e. The longitudinal grade of the roadway or intersection approaches does not exceed 5%.

For assistance, please contact the Layton City Engineering Department at Layton City Public Works (801-229-7070).

Once the City determines that the above minimum criteria are met, the neighborhood representative will be informed to proceed with the petition process.

3.4 NEIGHBORHOOD PETITION

The purpose of the **TRAFFIC CALMING PETITION** is to establish minimum neighborhood support to proceed with the Layton City traffic calming program. One petitioner per household may sign the petition and petitioners must reside on the street where traffic calming is requested. A minimum of ten (10) signatures are required for the City to perform a traffic study and start reviewing traffic issues on the study street. A completed petition doesn't necessarily ensure that calming measures will be installed on the study street, but it does allow the City to continue with a traffic study and scoring process. The City Engineering Department accepts traffic petitions at any time during the year and petitions are processed on a first-come first-served basis.

The neighborhood representative should be the first to sign the petition and is the liaison between the City and the neighborhood and is responsible for obtaining the required minimum number of signatures (ten) for the traffic calming request to be accepted by the City.

3.5 REVIEW AND RANKING

3.5.1 Traffic Study

Layton City will verify petition signatures and perform a traffic analysis to evaluate neighborhood concerns. Depending on the traffic issues in the neighborhood various traffic study components may include: traffic volumes, travel speeds, signing and striping, circulation, vehicle queuing, intersection operations, driver sight distance, accidents, proximity to sensitive facilities, pedestrian safety, etc.

3.5.2 Scoring

The purpose of the scoring process is to determine which neighborhood traffic calming project has the most need. If there are multiple traffic calming requests being processed by the City concurrently a scoring and ranking system will be used to prioritize projects. Scoring will be performed by City staff after the traffic analysis is complete.

3.5.3 Ranking

Once the traffic study is complete and the request has been scored, projects are ranked. The highest ranked projects will be accommodated first depending on the availability of funding resources.

3.6 SELECTING MEASURES

Based on the character of the traffic problem and the collected data, the City will develop possible calming measures. Public neighborhood meetings will be held to discuss the appropriate measure. The neighborhood representative, original petitioners, other impacted residents, home owner association representatives, police, fire, etc., shall be in attendance. Certain measures may affect more residents than the original petitioners. If this is the case, the City will notify the affected residents and an additional public meeting may be required.

The affected neighborhood residents (as determined by the City) will then vote on whether the chosen measure and location is acceptable. **SEVENTY-FIVE PERCENT (75%)** or more of the residents need to approve the recommended measure in order to proceed with submittal to the City Council. In instances where a temporary measure is to be installed, **FIFTY PERCENT (50%)** of affected residents must approve a temporary measure and **SEVENTY-FIVE PERCENT (75%)** are needed to approve permanent installation.

3.7 APPROVAL AND IMPLEMENTATION

The selected traffic calming measure will then be presented to the City Council for approval. Large traffic calming projects may be required to be included in the next years Capital Improvement Plan (CIP).

3.8 CONSTRUCTION

Some measures may require temporary installation in order to evaluate the effectiveness and impact to an area prior to final design. Other measures may be able to be installed permanently without a trial period. This decision is left to the discretion of the City Engineer and City Council.

3.9 EVALUATION

After the traffic calming measure has been constructed, Layton City may evaluate the effectiveness of the installed traffic calming device. This is to ensure the effectiveness of the measure. If ineffective, the City may decide to remove the traffic calming measure or in the case of temporary installation the City may decide not to install a permanent measure.

REQUEST FOR TRAFFIC CALMING

Please read "*Traffic Calming Program Instructions"* before starting the traffic calming request process!

Date:_______________ Neighborhood Representative:____

The neighborhood representative will serve as the liaison between the neighborhood and Layton City and is responsible for obtaining the appropriate petition signatures.

Daytime Phone Number:___________________________ Alternate Phone Number:___________________

Address: ____

____

Name and phone number of Home Owners Association Representative if applicable:

____

Neighborhood Name: ____

Council Representative: ____

Please indicate traffic issues that concern the residents in your neighborhood.

	Speeding		Traffic Volumes
	Pedestrian/Bicycle Safety		Accidents
	Blocked Line of Sight		Access/Traffic Operations
	Other (explain):		
Description/Location of Problem			

Return to: Layton City Public Works, 1450 West 550 North, Layton, UT 84057

PETITION

Please read "*Traffic Calming Program Instructions"* before starting the traffic calming request process!

Come Now, the residents on ____ (street) located between ____ (cross street) and ____ (cross street), hereinafter referred to as the "Petitioners", hereby petition Layton City to consider the installation of traffic calming measures to mitigate traffic issues on our above referenced street and detailed on the submitted "Request Form".

Petitioners must be at least 18 years of age and reside in separate households. By signing this petition you agree to allow traffic calming measures to be installed on your street that may permanently restrict access or parking along your street. There must be a minimum of ten petitioners to process this request.

Signature	Printed Name	House #	Phone #
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			

Return to: Layton City Public Works, 1450 West 550 North, Layton, UT 84057

SCORING

85th Percentile Speed (20 points maximum) ___________pts

The 85th percentile speed represents the speed, at or below which, 85 percent of the free flowing vehicles are traveling. Points will be assigned based on the difference between the posted speed limit and the 85th percentile speed as follows:

0 points, less than or equal to 5 mph difference	or	(30 mph)
5 points, greater than 5 mph and less than or equal to 7 mph	or	(32 mph)
10 points, greater than 7 mph and less than or equal to 9 mph	or	(34 mph)
15 points, greater than 9 mph and less than or equal to 11 mph	or	(36 mph)
20 points, greater than 11 mph	or	(37 mph+)

Traffic Volume (25 points maximum) ___________pts

Average Daily Traffic (20 points maximum) ___________pts

Points for Average Daily Traffic (ADT) will be assigned as follows:

0 points, less than 800 ADT
5 points, 801 ADT to 1,500 ADT
10 points, 1,501 ADT to 2,500 ADT
15 points, 2,501 ADT to 3,500 ADT
20 points, more than 3,500 ADT

Peak Hour Volume (5 points maximum) ___________pts

The percent of the daily traffic occurring during the peak hour will be assigned points as follows:

0 points, peak hour traffic is less than 10% of Average Daily Traffic
5 points, peak hour traffic is equal to or greater than 10% of Average Daily Traffic

3-Year Crash Data (20 points maximum) ___________pts

0 points, less than 7 crashes over the last 3 years
10 points, 7 to 12 crashes over the last 3 years
20 points, more than 12 crashes over the last 3 years

Pedestrian Facilities (5 points maximum) ___________pts

0 points, sidewalks are present and continuous on BOTH sides of the street throughout the project limits
2 points, sidewalks are discontinuous or do not exist on ONE side of the street throughout the project limits
5 points, sidewalks are discontinuous or do not exist on BOTH sides of the street throughout the project limits

Sensitive Facilities (30 points maximum) ___________pts

Sensitive facilities include schools, senior centers, libraries, community centers, and sites with significant pedestrian activity.

0 points, no sensitive facilities or pedestrian crossings
10 points, roadway is within **High School** Safe Route to School boundary or other sensitive facility
20 points, roadway is within **Middle School** Safe Route to School boundary
30 points, roadway is within **Elementary School** Safe Route to School boundary

Total Points Maximum (100) **Total Score** ___________pts

LAYTON CITY

TRAFFIC CALMING TOOLBOX

Layton

Community • Prosperity • Choice

ADOPTED 2015

PREPARED BY

HORROCKS ENGINEERS

CONTENTS

LIST OF FIGURES

INTRODUCTION

The process of selecting suitable traffic calming measures involves the following steps. First, identify the nature and location of the traffic problem (i.e. speeding, congestion, etc). Second, select the appropriate traffic calming measure capable of solving the identified problems. The traffic calming measures should be selected from a "toolbox" of possible alternatives that describes the possible measures with their application and effectiveness at solving specific traffic problems.

This document, designed as a companion to **LAYTON CITY – GUIDELINES FOR TRAFFIC CALMING** describes the traffic calming measures that may be considered by Layton City as alternatives to solving traffic problems. In this document the following five groups of traffic calming measures will be described in detail:

- Non-Physical Measures
- Volume Control Measures
- Vertical Speed Control Measures
- Horizontal Speed Control Measures
- Narrowing Measures

Each group will include descriptions for specific measures along with their application, cost and effectiveness. In addition, a summary of the appropriateness of each type of traffic calming measure in dealing with different traffic problems will be presented. An overview of the design principles that should be applied in designing each type of traffic control measure will be explained. In some cases it may be appropriate to combine two or more specific types of traffic calming methods to achieve the desired result or to potentially address two separate problems. When this occurs, it should be identified and analyzed on a case by case basis.

1.0 NON-PHYSICAL MEASURES

Non-Physical Measures include signage or speed enforcement which do not require any construction or physical modifications to the roadway infrastructure. These items should be attempted first since they can be economical and easy to remove. Non-physical measures have been shown to have negligible success when used as traffic calming measures.

1.1 SPEED ENFORCEMENT

For areas where speed has been determined as being excessive (generally an 85^{th} percentile speed 7 mph above the posted speed limit), speed enforcement can used be a temporary traffic calming measure.

TARGETED SPEED ENFORCEMENT can be attempted on areas where speeding is observed by neighborhood residents and/or agency representatives. For major roadways, using limited personnel can be cost effective. For low volume streets, periodic daytime speed enforcement is the best option. Because of the expense to maintain increased levels of police enforcement, targeted speed enforcement should only be used temporarily and/or in conjunction with other new traffic calming measures to help drivers become aware of new restrictions.

Another available enforcement option is a **RADAR TRAILER DEVICE**, which measures and displays a vehicles speed as it approaches as shown in **Figure 1**. The posted speed limit is shown in clear view next to the digital readout showing the actual speed of the oncoming vehicle. This reminds drivers to slow to the appropriate speed and often it comes as a surprise to the driver to see how fast they are travelling. These devices can be easily transported and deployed at different locations.

Effectiveness: Negligible

Figure 1: Radar Trailer Device

Advantages
Inexpensive if used temporarily
Does not require time for design
Does not slow trucks and emergency vehicles

Disadvantages
Expensive to maintain for a long period
Trailer subject to vandalism

1.2 RADAR SPEED SIGN

Figure 2: Radar Speed Sign

The **RADAR SPEED SIGN** shown in **Figure 2**, is similar to the radar trailer device. The difference between the radar speed sign and the radar speed trailer is that the radar speed sign is mounted to existing speed limit signs. Some devices have the ability to store data over time to provide speed data to the City. The radar speed sign works similarly with the speed radar trailer by displaying a vehicles speed next to the posted speed limit sign.

Effectiveness: Negligible

Advantages
Can mount to existing poles
Does not require much time for design
Does not slow trucks and emergency vehicles

Disadvantages
Has not been shown to significantly reduce speeds
High cost of long-term maintenance

1.3 LANE STRIPING

LANE STRIPING, shown in **Figure 3,** can be used to create formal bicycle lanes, parking lanes and/or edge lines. The striping "narrows" the travel lane for vehicles and may encourage drivers to lower their speeds.

Effectiveness: Negligible

Figure 3: Bike Lane Narrowing

ADVANTAGES
Inexpensive
Can be used to create bicycle lanes or delineate on-street parking
Does not require much time for design
Does not slow trucks and emergency vehicles

DISADVANTAGES
Increases regular maintenance
Has not been shown to significantly reduce travel speeds

1.4 SIGNAGE

Figure 4: Typical Signage

SIGNAGE, as shown in **Figure 4**, be used as a traffic calming measure. Speed limit signs should only be placed after an engineering study is performed. Restriction type signs include: NO TRUCKS, CROSS TRAFFIC DOES NOT STOP, NO RIGHT TURN, NO LEFT TURN, NO THRU TRAFFIC.

Effectiveness: Negligible

ADVANTAGES	DISADVANTAGES
Inexpensive	Ineffective if not accompanied by enforcement
Turn restrictions can reduce cut-through traffic	Speed must be set at a reasonable value for drivers to follow
Does not slow trucks and emergency vehicles	Has not been shown to significantly reduce travel volume or speeds

1.5 SPEED LEGEND

SPEED LEGENDS, shown in **Figure 5**, are numbers painted on the roadway indicating the speed limit. These are usually painted near the speed limit signposts. Speed legends may be useful for reinforcing speed reduction between different roadway segments (e.g., from one functional class to another or at major residential entry points).

Effectiveness: Negligible

Figure 5: Speed Legend

ADVANTAGES	DISADVANTAGES
Inexpensive	Has not been shown to significantly reduce travel speeds
May help reinforce a change in speed limit	
Does not require much time for design	
Does not slow trucks and emergency vehicles	

1.6 ANGLED PARKING

Figure 6: Angled Parking

ANGLED PARKING reduces the width of a travel lane, which will likely reduce vehicle speeds. Angled parking increases the number of available parking spaces on a roadway. This is effective when there are stores that front the roadway with limited parking lots. Angled parking changes the parking position from parallel to a 30°-60° angle.

A safer option is to use Reverse Angled Parking. Like parallel parking, the driver backs into the angled parking stall. When exiting, the driver does not blindly back the rear half of the vehicle into the travel, rather they are able to pull forwards out of the parking stall improving safety.

Effectiveness: Negligible

ADVANTAGES	DISADVANTAGES
Reduces speeds by narrowing travel lanes	Does not allow for bike lanes
Increases the number of parking spaces	Ineffective on roadways with frequent driveways
Makes parking maneuvers easier than parallel parking	Potential safety concerns when backing out
Favored by businesses and multi-family residences	

2.0 VOLUME CONTROL MEASURES

VOLUME CONTROL MEASURES reduce the quantity of vehicles that use the roadway. They use barriers to restrict one or more movements at an intersection. Their primary purpose is to divert traffic away from the trouble area thus reducing cut-through traffic. Typical volume control measures are full street closures, half street closures, diagonal diverters, median barriers, and forced turn islands. Volume Control Measures are typically applied only after other measures have failed or been determined inappropriate. Pedestrian and bicycle traffic can usually be accommodated. Volume Control Measures are often used in sets to make travel through neighborhoods more circuitous, and are typically staggered internally in a neighborhood, which leaves through movement possible but less attractive than alternative (external) routes. Volume Control Measures have also been used as a crime prevention tool.

2.1 FULL CLOSURE

FULL STREET CLOSURES are barriers are placed across a street to completely close the street to through-

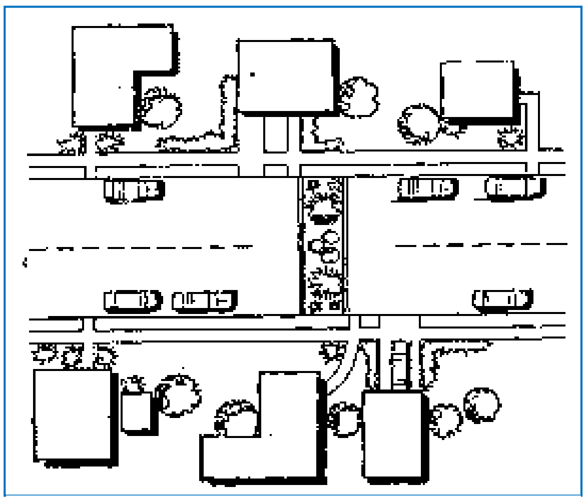


Figure 7: Full-Street Closure Diagram

Figure 8: Full-Street Closure

traffic, usually leaving only sidewalks open. Pedestrian and bicycle traffic are usually unrestricted. Typical barriers include: landscaped islands, walls, gates, side-by-side bollards, posts, etc. The barrier should be designed to eliminate vehicles (e.g. passenger cars) from entering.

Effectiveness: Average 44% decrease in traffic volume

ADVANTAGES	DISADVANTAGES
Able to maintain pedestrian and bicycle access	Cause indirect routes for local residents and emergency vehicles
Does not adversely affect access by children	May limit access to businesses
Very effective in reducing traffic volumes	May be expensive

2.2 HALF CLOSURE

HALF CLOSURES, shown in **Figure 9** and **Figure 10**, are barriers which block travel in one direction for a short distance Half Closures are also called partial closures, entrance barriers, or one-way closures. Typical barriers include: landscaped islands, walls, gates, side-by-side bollards, posts, etc.

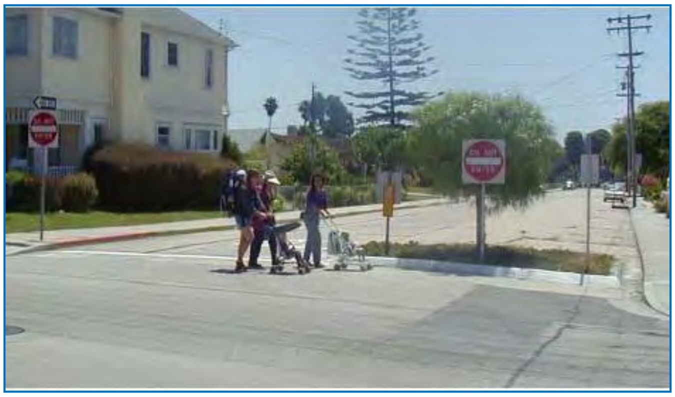


Figure 10: Half Closure

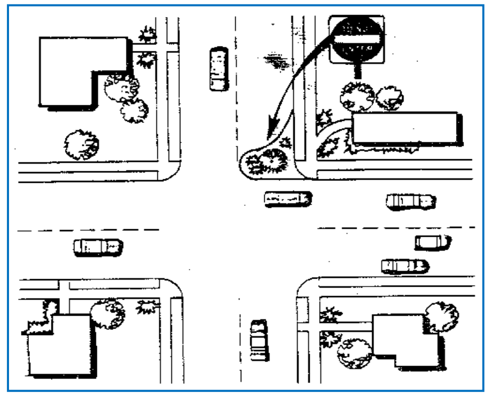


Figure 9: Half Closure Diagram

Effectiveness: Average 42% decrease in traffic volume

ADVANTAGES	DISADVANTAGES
Able to maintain pedestrian and bicycle access	Cause indirect routes for local residents
Does not affect emergency vehicles	May limit access to businesses
Effective in reducing traffic volumes	May be expensive
	Drivers can circumnavigate barrier

2.3 DIAGONAL DIVERTER

DIAGONAL DIVERTERS, shown in **Figure 11** and **Figure 12**, are barriers placed diagonally across an intersection, blocking through and/or turning movements; they are sometimes called full diverters or diagonal road closures. Typical barriers include: landscaped islands, walls, gates, side-by-side bollards, posts, etc. *Effectiveness: Average 35% decrease in traffic volume*

Figure 11: Diagonal Diverter

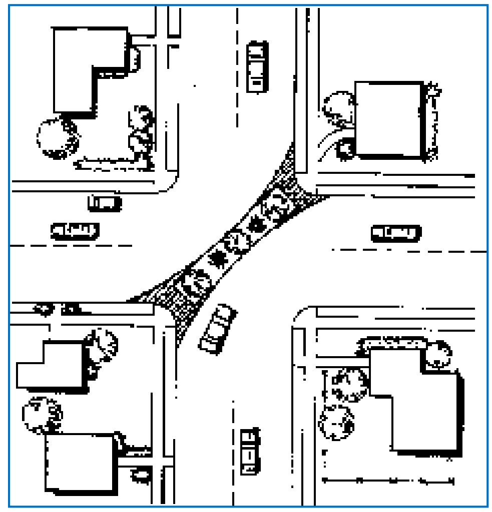


Figure 12: Diagonal Diverter Diagram

ADVANTAGES	DISADVANTAGES
Able to maintain pedestrian and bicycle access	Cause indirect routes for local residents and emergency vehicles
Effective in reducing traffic volumes	May be expensive
	May require construction of corner curbs

2.4 MEDIAN BARRIER

MEDIAN BARRIERS, shown in **Figure 13** and **Figure 14**, are raised islands in the center of a street which continues through an intersection to block left turning movements from all intersection approaches.

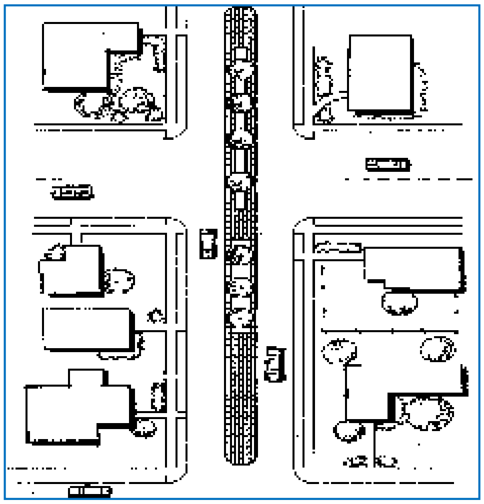


Figure 14: Median Barrier Diagram

Figure 13: Median Barrier

Effectiveness: Average 31% decrease in traffic volume

ADVANTAGES	DISADVANTAGES
Can improve safety at intersection by prohibiting dangerous turning movements	May require right-of-way acquisition
Can reduce traffic volumes on a cut-through route that crosses the major street	Limits turns to and from side street for local residents
	May limit access for emergency vehicles

2.5 FORCED TURN ISLAND

FORCED TURN ISLANDS, shown in **Figure 15** and **Figure 16**, are barrier islands that block certain movements on approaches to an intersection. Designs can vary significantly depending on the installation location. This is also referred as "right-in, right-out access". Forced turn islands are best when used on residential streets at intersections with larger streets. The larger street accommodates the diverted traffic and in some cases center line barriers or channelization is used to eliminate drivers from circumnavigating the measure.

Figure 15: Forced Turn Island

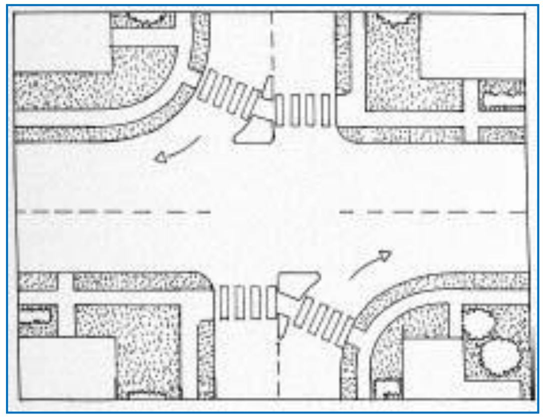


Figure 16: Forced Turn Island Diagram

Effectiveness: No Data

ADVANTAGES	DISADVANTAGES
Can improve safety at intersection by prohibiting dangerous turning movements	May simply divert traffic problem to a different street
	May limit access for local residents

3.0 VERTICAL SPEED CONTROL MEASURES

VERTICAL SPEED CONTROL MEASURES are usually raised segments of the roadway that vary in height and width. These are designed to force a vehicle to slow down in order to comfortably navigate them. Typical vertical speed control measures include speed humps, speed tables, raised crosswalks and raised intersections.

3.1 SPEED HUMP

SPEED HUMPS, shown in **Figure 17**, are raised rounded devices usually constructed from asphalt that is placed across the roadway. Speed humps are usually 3 to 4 inches in height and are parabolic or sinusoidal in shape. They extend fully across the roadway but are tapered on each side to allow unimpeded water flow in a curb and gutter system. The design speed for a speed hump is approximately 15-25 mph.

One modification to the speed hump is the speed lump, shown in **Figure 18**. Speed lumps are essentially the same as speed humps except they do not extend the full width of the road. Speed lumps are split into three lumps with approximately one foot spacing between each one. They are specifically designed to accommodate the axle width of emergency vehicles.

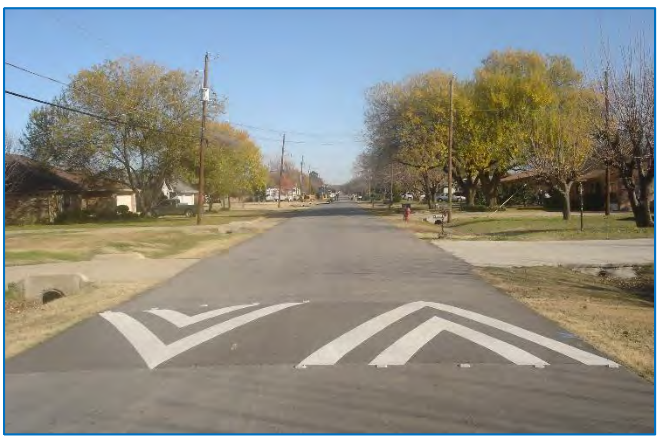


Figure 17: Speed Hump

Figure 18: Temporary Speed Lumps

Effectiveness: 22% reduction in 85th percentile travel speed. 11% reduction in accidents.

ADVANTAGES	DISADVANTAGES
Relatively Inexpensive	Causes a rough ride for drivers
Relatively easy for bicyclists to cross at taper if designed correctly	Slows and may damage emergency vehicles
Very effective at slowing travel speed	Increase noise and air pollution
	Poor aesthetics

3.2 SPEED TABLE

Figure 19: Temporary Speed Table

A **SPEED TABLE**, shown in **Figure 19**, is a raised flat-topped device, which is placed across the roadway. Speed tables are usually 3 to 4 inches in height. The flat-top is approximately 22 feet in the direction of travel and each ramp is 6 feet long. The flat-top is usually constructed of asphalt, concrete, brick, or other textured materials. The ramps are parabolic in shape and are usually made of asphalt. Speed tables extend fully across the roadway but are tapered on each side to allow unimpeded water flow in curb and gutter systems. The design speed for a speed table is approximately 30 mph, which is a safe and comfortable speed for passenger vehicles.

Effectiveness: 18% reduction in 85th percentile travel speed. 45% reduction in accidents.

ADVANTAGES	DISADVANTAGES
Relatively Inexpensive	Poor aesthetics if no textured material is used
Smoother on large vehicles than speed humps	Some textured material can be expensive
Effective at lowering travel speeds	Increased noise
	Slows and may damage emergency vehicles

3.3 RAISED CROSSWALK

RAISED CROSSWALKS, shown in **Figure 20**, are speed tables with crosswalk markings and signage. The only geometric difference between the two is the raised crosswalk extends from curb to curb and the raised crosswalk may be longer and higher than a typical speed table.

Effectiveness: 18% reduction in 85th percentile travel speed. 45% reduction in accidents.

Figure 20: Raised Crosswalk

ADVANTAGES
Relatively Inexpensive
Smoother on large vehicles than speed humps
Improves safety for pedestrians
Effective at lowering travel speed

DISADVANTAGES
Poor aesthetics if no textured material is used
Some textured material can be expensive
Increased noise
Slows and may damage emergency vehicles
May change or restrict drainage

3.4 RAISED INTERSECTION

Figure 21: Raised Intersection

RAISED INTERSECTIONS, seen in **Figure 21,** are like speed tables that cover an entire intersection. Ramps are present on all approaches. The flat-top area is usually a textured material and are raised to sidewalk level to provide an edge for the visually impaired. If there is a concern about loss of on-street parking, raised intersections are a more acceptable traffic calming measure.

Effectiveness: 1% reduction in 85th percentile travel speed.

ADVANTAGES
Improve safety for pedestrians and vehicles
Can calm two streets at same time

DISADVANTAGES
Some textured materials can be expensive
Increased noise
Less effective at reducing travel speeds
May change or restrict drainage

4.0 HORIZONTAL SPEED CONTROL MEASURES

HORIZONTAL SPEED CONTROL MEASURES are segments of roadway where the straight line of travel has been altered to cause a vehicle to change direction and reduce speed. Typical horizontal speed control measures include chicanes, traffic circles, roundabouts, and lateral shifts.

4.1 TRAFFIC CIRCLE

A **TRAFFIC CIRCLE**, shown in **Figure 22**, is a raised island placed in the center of an intersection which forces vehicles to reduce speed. Generally, traffic circles are circular in shape and have some type of landscaping in its center. Also, traffic circles have outer rings (truck aprons or lips) that are mountable so large vehicles can circumnavigate the small radius traffic circle.

Effectiveness: 11% reduction in 85th percentile travel speed. 29%-73% reduction in accidents.

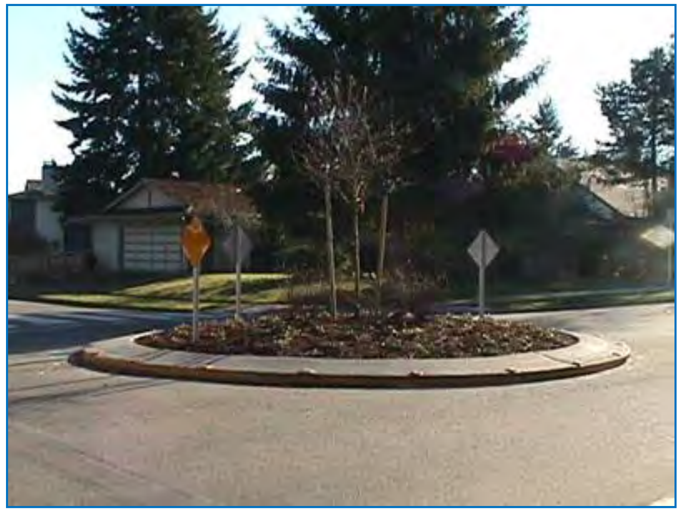


Figure 22: Traffic Circle

ADVANTAGES	DISADVANTAGES
Provides increased access to street from side street	Landscaping must be maintained
Breaks up sight-lines on straight street	Difficult for large vehicles (e.g. fire truck) to circumnavigate
Effective at lowering travel speeds	Potential loss of on-street parking
	May require modifications to curb, gutter and sidewalks

4.2 ROUNDABOUT

Figure 23: Roundabout

A **ROUNDABOUT**, shown in **Figure 23**, is similar to a traffic circle. It also has a raised island placed at an intersection with circulating traffic. Roundabouts generally are much larger than traffic circles and thus need more right of way for construction. Roundabouts are used at intersections with higher traffic volumes and are designed for higher speeds. Roundabouts generally have raised splitter islands that direct traffic to the right, which helps form gaps in traffic. Roundabouts may also have flared entry lanes, which increase the capacity of the intersection. Roundabouts may also have bypass lanes, typically for right turning vehicles, to allow drivers to travel through the intersection without entering the intersection at all.

Effectiveness: 29% reduction in accidents.

ADVANTAGES	DISADVANTAGES
Enhanced safety compared to traffic signal	Landscaping must be maintained
Minimizes queuing at approaches	May require major reconstruction and extensive right-of-way
May be effective at slowing travel speed	Potential loss of on-street parking
	Increase pedestrian distance and travel time on crosswalks

4.3 CHICANE

CHICANES, shown in **Figure 24**, are curb extensions or edge islands that alternate from one side of roadway to the other. These curb extensions or edge islands give the roadway a more 'winding' attribute. Curb extensions or edge islands can be semi-circular, triangular or squared off. Trapezoidal islands have been found to be more effective at reducing speeds than semi-circular shapes. Curb extensions or edge islands should have a vertical element to draw attention to them. Trees and other landscape materials are an option. For low speed roadways or roadways that lack right-of-way, mountable curbs are also an option to allow larger vehicles to maneuver through the chicanes.

Figure 24: Chicane

Chicanes can also be formed by alternating on-street parking from one side of the roadway to the other. Parking bays can be created using striping or by installing landscaped islands at each end.

Effectiveness: No Data

ADVANTAGES	DISADVANTAGES
Discourages high speeds by forcing horizontal deflection	Landscaping must be maintained
Negotiable by large vehicles (e.g. fire truck)	Require major reconstruction and extensive right-of-way
	Potential loss of on-street parking

4.4 LATERAL SHIFT

Figure 25: Lateral Shift

A **LATERAL SHIFT**, shown in **Figure 25**, is like a chicane, however the roadway alignment only shifts once. It is only one curb extension or edge island rather than a series of alternating curb extensions or edge islands. Because the road alignment shifts only once, the crossing speed is approximately 5 mph higher than a series of chicanes. A higher speed means that lateral shifts can be placed on higher functional classification roadways (collectors and arterials). Typical lateral shifts incorporate a landscaped center island to separate opposing traffic. This prohibits drivers from veering into the opposite lane.

Effectiveness: No Data

ADVANTAGES	DISADVANTAGES
Can accommodate higher traffic volumes	Potential loss of on-street parking
Negotiable by large vehicles (e.g. fire truck)	May require additional design effort

5.0 NARROWING MEASURES

NARROWING MEASURES are short roadway segments that are narrower than the typical roadway section. Typical narrowing measures are neckdowns, chokers, and island narrowing.

5.1 NECKDOWN

NECKDOWNS, shown in **Figure 26**, are curb extensions at an intersection. Neckdowns reduce the roadway width from curb to curb and provide shorter pedestrian crossing distances and times. The short curb return radius also reduces the speeds of turning vehicles.

Effectiveness: 7% reduction in 85th percentile speed.

Figure 26: Neckdown

ADVANTAGES	DISADVANTAGES
Improves pedestrian comfort and safety	Effectiveness may be limited because there is no vertical or horizontal deflection
Through and left turn movements are negotiable by large vehicles (e.g. fire trucks)	Right turn not easily negotiable by large vehicles (e.g. fire trucks)
Can create protected on-street parking	Potential loss of on-street parking
May reduce speeds and traffic volumes	May bring bicycle lanes in closer proximity with travel lanes
	May change or restrict drainage

5.2 CHOKER

Figure 27: Choker

CHOKERS, shown in **Figure 27**, are curb extensions at mid-block that narrow the roadway by widening the sidewalk, planting strip, or centerline. A typical two-lane choker is 20 feet from curb to curb. One-lane chokers narrow the roadway to just one travel lane. This is similar to a one-lane bridge condition. The constricted length in the direction of travel varies but should be kept short enough not to block the driveways or accesses.

Effectiveness: 7% reduction in 85th percentile speed.

ADVANTAGES	DISADVANTAGES
Negotiable by large vehicles (e.g. fire trucks)	Effectiveness may be limited because there is no vertical or horizontal deflection
May reduce travel speeds and volumes	May bring bicycle lanes in closer proximity with travel lanes
Can have positive aesthetic value	Potential loss of on-street parking
	One-lane choker can only be used on extremely low volume roadways without causing safety concerns or traffic congestion
	May limit driveway access

5.3 CENTER ISLAND

CENTER ISLANDS, shown in **Figure 28**, are raised barriers in the center of the roadway that narrow the travel lanes. The center island should be large enough to draw attention (e.g. 6 feet wide by 20 feet long). The center island can also be offset to the left from the perspective of approaching traffic. They are often landscaped and can be used as refuge for pedestrians crossing the roadway. Center islands create intermittent left turn areas rather than a continuous median. Center islands placed at intersections or entrances to neighborhoods are often called gateways.

Figure 28: Center Island

Effectiveness: 7% reduction in 85th percentile speed.

ADVANTAGES	DISADVANTAGES
Increases pedestrian safety	Effectiveness may be limited because there is no vertical or horizontal deflection
May reduce travel speeds and volumes	Potential loss of on-street parking
Can have positive aesthetic value	If center island is too long, channelized traffic may increase travel speed
	Plants and irrigation must be kept to a minimum due to pavement deterioration from water runoff

6.0 APPROPRIATENESS OF TRAFFIC CALMING MEASURES

After identifying and characterizing an existing traffic problem, an appropriate traffic calming measure to be implemented. The major types of traffic problems are:

- Speed – vehicle speeds are too high.
- Traffic Volume – vehicle usage levels are too high and are affecting level of service.
- Safety – vehicles have excessive level of risk (e.g. accident history). Pedestrians and bicyclists are at unnecessary risk due to vehicles.
- Pollution – vehicles cause excessive levels of noise, vibration, and air pollution.

Besides the traffic problem types, there are other issues such as location and traffic constraints that can be investigated. The following **TABLE 1** and **TABLE 2** present each traffic calming measure and its appropriateness versus problem type, location type and traffic constraints. The appropriateness is an assessment derived from the literature search of the state of the industry and results from other agencies.

Table 1: Traffic Calming Measures versus Traffic Problem Type

Traffic Calming Measure	Traffic Problem Type			
	Speed	Traffic Volume	Safety	Pollution
1.0 Non-Physical				
1.1 Speed Enforcement	🟢	🟠	🔵	🔵
1.2 Lane Striping	🟢	🟠	🟠	🟠
1.3 Signage	🟢	🟠	🟠	🟠
1.4 Speed Legend	🟢	🟠	🟠	🟠
1.5 Raised Pavement Marker	🟠	🟠	🟢	🟠
1.6 Angled Parking	🟢	🔵	🟠	🟠
2.0 Volume Control				
2.1 Full Closure	🟢	🟢	🟠	🟠
2.2 Half Closure	🟢	🟢	🟠	🟠
2.3 Diagonal Diverter	🟢	🟢	🟠	🟠
2.4 Median Barrier	🟠	🟢	🔵	🟠
2.5 Forced Turn Island	🟠	🟢	🔵	🟠
3.0 Vertical Speed Control				
3.1 Speed Hump	🟢	🟢	🔵	🔴
3.2 Speed Table	🟢	🔵	🔵	🔴
3.3 Raised Crosswalk	🟢	🔵	🔵	🔴
3.4 Raised Intersection	🟢	🔵	🔵	🔴
4.0 Horizontal Speed Control				
4.1 Traffic Circle	🟢	🔵	🟢	🟠
4.2 Roundabout	🔵	🔵	🟢	🟢
4.3 Chicane	🟢	🔵	🟠	🟠
4.4 Lateral Shift	🔵	🔵	🟠	🟠
5.0 Narrowing				
5.1 Neckdown	🟢	🔵	🟢	🟠
5.2 Choker	🟢	🔵	🔵	🟠
5.3 Center Island	🟢	🔵	🟢	🟠

Legend:

🟢 Strongly Appropriate; 🔵 Moderately Appropriate; 🟠 Moderately Inappropriate; 🔴 Inappropriate

Table 2: Traffic Calming Measure versus Location Type

Traffic Calming Measure	Traffic Problem Type			
	Residential		Non-Residential	
	Mid-Block	Intersection	Mid-Block	Intersection
1.0 Non-Physical				
1.1 Speed Enforcement	🟢	🟢	🟢	🟢
1.2 Lane Striping	🟢	🔴	🟢	🔴
1.3 Signage	🟢	🟢	🟢	🟢
1.4 Speed Legend	🟢	🟢	🟢	🟢
1.5 Raised Pavement Marker	🟢	🔴	🟢	🔴
1.6 Angled Parking	🟢	🔴	🟢	🔴
2.0 Volume Control				
2.1 Full Closure	🔴	🟢	🔴	🔴
2.2 Half Closure	🔴	🟢	🔴	🔴
2.3 Diagonal Diverter	🔴	🟢	🔴	🔴
2.4 Median Barrier	🔴	🟠	🔴	🔴
2.5 Forced Turn Island	🔴	🟠	🔴	🟢
3.0 Vertical Speed Control				
3.1 Speed Hump	🟢	🔴	🔴	🟠
3.2 Speed Table	🟢	🔴	🔴	🟢
3.3 Raised Crosswalk	🟢	🟠	🟢	🔴
3.4 Raised Intersection	🔴	🟢	🟢	🔴
4.0 Horizontal Speed Control				
4.1 Traffic Circle	🔴	🟢	🔴	🟠
4.2 Roundabout	🔴	🟠	🔴	🟢
4.3 Chicane	🟢	🔴	🟢	🔴
4.4 Lateral Shift	🟢	🔴	🟢	🔴
5.0 Narrowing				
5.1 Neckdown	🔴	🟢	🔴	🟢
5.2 Choker	🟢	🔴	🟢	🔴
5.3 Center Island	🟢	🟢	🟢	🟢

Legend:

🟢 Applicable; 🟠 Applicable in Some Cases; 🔴 Not Applicable

7.0 GENERAL DESIGN PRINCIPLES

The following are general design principles that should be considered before and after traffic calming measure implementation.

7.1 DATA COLLECTION

One of the initial steps that should be considered prior to traffic calming measure implementation is data collection. The following data items can be collected:

1. Twenty-four (24) hour directional approach volumes for each leg of an intersection should be obtained to identify the heaviest eight hours.
2. Twenty-four (24) hour directional volumes for the roadway should be obtained to identify the heaviest eight hours.
3. Percentage of large trucks that would be using the roadway or intersection.
4. Posted speeds for all roadways.
5. 85th percentile speed for all intersection approaches and roadways.
6. Miscellaneous data, such as existing roadway geometry, drainage information, area population, land uses, distances to intersections, and intersection control treatments.
7. Bicycle and pedestrian counts for intersections and midblock locations.
8. Detailed accident data to analyze the frequency and types of collisions occurring at intersections or along roadways.
9. Community considerations should be investigated, including the need for parking, the landscaping character of the area and existence of other existing traffic calming measures.
10. Transit routes and frequencies in the study area.

7.2 APPLICATION GUIDELINES

Criteria that should be considered are listed below for the different physical traffic calming measures.

7.2.1 VOLUME CONTROL

The following criteria should be considered when installing volume control measures:

1. Roadway segments with daily traffic volumes less than 5,000 vehicles per day.
2. Intersections with only one lane per approach.
3. 25% of traffic is non-local traffic.

7.2.2 VERTICAL SPEED CONTROL

The following criteria should be considered when installing vertical speed control measures:

1. Daily traffic volume less than 7,500 vehicles per day.

2. Speed humps should be considered if the daily traffic volume is less than 4,000 vehicles per day.
3. Posted speed limit is 25 mph or less.
4. Approach or street grades of less than 5%.

7.2.3 HORIZONTAL SPEED CONTROL

The following criteria should be considered when installing horizontal speed control measures:

1. All roadway functional classes.
2. Traffic circles and chicanes should only be considered if the daily entering traffic volume is less than 5,000 vehicles per day.
3. Traffic circles should be considered on intersections where there is one lane per approach.
4. Low volumes of buses and trucks (less than 2%).
5. Posted speed limit of 25 mph or less.
6. Roundabouts should only be considered where the grade on the approach streets is less than 5%.

7.2.4 NARROWING CONTROL

The following criteria should be considered when installing narrowing control measures:

1. All roadway functional classes.
2. One lane chokers should only be considered if the daily entering traffic volume is less than 3,000 vehicles per day.
3. Posted speed limit of 25 mph or less.
4. Bicycle and pedestrian traffic should be accommodated in design.

7.2.5 OTHER CONSIDERATIONS

The following are other considerations that are applicable to all traffic calming measures:

1. Community sentiment.
2. Number and types of accidents.
3. Presence of pedestrian crosswalks.
4. Presence of curb and gutter.
5. Drainage.
6. Presence of parking.
7. Location within roadway network (e.g., minimum distance from other intersections).
8. Emergency vehicles, bus routes, snow plowing routes.
9. Previously attempted traffic calming measures (e.g., targeted speed enforcement, painted speed legends etc.).

7.3 GEOMETRY

The following are general criteria that should be considered when installing traffic calming measures.

1. Examine as-is geometry of roadway or intersection.
2. Check physical feasibility of installing traffic calming measure.
3. Determine desired crossing speed (i.e., design speed) at slow points of traffic calming measure.
    a. For vertical speed control measures (e.g., speed humps), the typical design speed is 25 to 30 mph. Speed versus vertical curvature relationships can be found in ITE's *Traffic Calming State of Practice.*
    b. For horizontal speed control measures, (e.g., traffic circles and roundabouts), the center islands and circular perimeters need to be determined. Speed versus horizontal curvature relationships can be found in AASHTO's *A Policy on Geometric Design of Highways and Streets.*

7.4 SAFETY

As part of installing any traffic calming measure, signing and pavement markings should be incorporated as well. Agencies use the *Manual on Uniform Traffic Control Devices* (MUTCD) as general guidance; however, the MUTCD is not specific on any traffic calming measure.

1. Signage and pavement markings shall be designed using the latest *Manual on Uniform Traffic Control Devices* (MUTCD) as guidance. The following items should be considered:
    - Warning signs need not be used where hazards are self-evident.
    - Signs must be legible, which requires high visibility, lettering or symbols of adequate size and short legends for quick comprehension.
    - Sign lettering must be in upper-case letters of the type approved by the City and FHWA.
    - Signs must be reflectorized or illuminated to show the same shape and color by day and night.
    - Signs are ordinarily placed on the right-hand side of the road, where the driver is looking for them.
    - Signs are ordinarily mounted separately, except where one sign supplements another, as advisory speed plates supplement warning signs.
    - Before any street is opened to traffic, all hazardous conditions must be signed and marked.
    - Signs should be used conservatively.
    - Symbol signs are preferred to word signs when an appropriate symbol exists.
    - New symbols not readily recognizable should be accompanied by educational plaques.
    - Analogous signs shall be used for new situations similar to those for which standard signs already exist.
2. Signs should be limited to minimize confusion.
3. Signs should be placed in advance to warn drivers. Placement of advance warning signs should conform to guidance provided in the latest MUTCD.
4. Check sight distances by visiting sight before and after traffic calming measure installation.

5. Depending on the characteristics of the intersection, pedestrian crosswalk signs and pavement markings may be needed and should follow guidance provided in the latest MUTCD (*Section 3B.17* & *Section 2C.37).*
6. Depending on the characteristics of the intersection, bicycle lane signs and pavement markings may be needed and should follow guidance provided in the latest MUTCD.
7. If sidewalk ramps are needed, they should be constructed according the latest City standards and be ADA compliant.
8. Depending on the characteristics of the intersection, "no parking" signs may be needed as well as red painted curbs to properly mark the intersection.
9. Lighting should be installed to provide safe illumination. The following items should be considered:
    - Good illumination should be provided on the approach nose of the splitters islands, the conflict area where traffic enters the circulating stream and places where traffic streams separate at points of exits.
    - If applicable, pedestrian crossing areas should be illuminated.

Appendix H: Traffic Impact Study Requirements

Traffic Impact Study Requirements

When a Traffic Impact Study is required the study must be prepared according to the appropriate TIS level as shown below. The traffic study shall, at a minimum, incorporate Layton City principles and standards and national practices. Additional requirements and investigation may be imposed upon the applicant as necessary.

Traffic Study level I
Project ADT < 100 trips

No proposed modifications to traffic signals or roadway elements or geometry.

1. Study Area.

The study area, depending on the size and intensity of the development and surrounding development, may be identified by parcel boundary, area of immediate influence or reasonable travel time boundary.

The study area may be limited to or include property frontage and include neighboring and adjacent parcels. Identify site, cross, and next adjacent up and down stream access points within access category distance of property boundaries.

2. Design year.
Opening day of project

3. Analysis Conditions and Period
Identify site traffic volumes and characteristics.
Identify adjacent street(s) traffic volume and characteristics.

4. Identify right-of-way, geometric boundaries and physical conflicts.
Investigate existence of federal or state, no access or limited access control line.

5. Generate access point capacity analysis as necessary.
Analyze site and adjacent road traffic for the following time periods: weekday A.M. and P.M. peak hours including Saturday peak hours if required by the City Engineer. Identify special event peak hour as necessary (per roadway peak and site peak).

6. Design and Mitigation.
Identify operational concerns and mitigation measures to ensure safe and efficient operation pursuant to appropriate state highway access category.

Traffic Study Level II
Project ADT 100 to 500 trips

1. Study Area.

The study area, depending on the size and intensity of the development and surrounding development, may be identified by parcel boundary, area of immediate influence or reasonable travel time boundary. Intersection of site access drives with state highways and any signalized and unsignalized intersection within access category distance of property line. Include any identified queuing distance at site and study intersections

2. Design Year

Opening day of project

3. Analysis Period

Identify site and adjacent road traffic for weekday A.M. and P.M. peak hours (Saturdays if required by the City Engineer).

4. Data Collection

Identify site and adjacent street roadway and intersection geometries.
Identify adjacent street(s) traffic volume and characteristics.

5. Conflict / Capacity Analysis

Diagram flow of traffic at access point(s) for site and adjacent development.
Perform capacity analysis as determined by the City Engineer.

6. Right-of-Way Access

Identify right-of-way, geometric boundaries and physical conflicts.
Investigate existence of federal or state, no access or limited access control line.

7. Design and Mitigation

Determine and document safe and efficient operational design needs based on site and study area data.
Identify operational concerns and mitigation measures to ensure safe and efficient operation pursuant to appropriate state highway access category.

Project ADT 500 to 3,000 trips or peak hour < 500 trips.

1. Study Area

The study area, depending on the size and intensity of the development and surrounding development, may be identified by parcel boundary, area of immediate influence or reasonable travel time boundary. An acceptable traffic study boundary is 1/4-1/2 mile on each side of the project site per the City Engineer.

Intersection of site access drives with state highways and any signalized and unsignalized intersection within access category distance of property line. Include any identified queuing distance at site and study intersections.

2. Design Year

Opening day of project and five year after project completion.
Document and include all phases of development (includes out pad parcels).

3. Analysis Period

Analyze site and adjacent road traffic for weekday A.M. and P.M. peak hours including Saturday peak hours if identified as a high Saturday use.. Identify special event peak hour as necessary (adjacent roadway peak and site peak).

4. Data Collection

a. Daily and Turning Movement counts.
b. Identify site and adjacent street roadway and intersection geometries.
c. Traffic control devices including traffic signals and regulatory signs.
d. Traffic accident data

5. Trip Generation

Use equations or rates available in latest edition of ITE Trip Generation. Where developed equations are unavailable for intended land use, perform trip rate study and estimation following ITE procedures or develop justified trip rate agreed to by the Department.

6. Trip Distribution and Assignment

Document distribution and assignment of existing, site, background, and future traffic volumes on surrounding network of study area.

7. Conflict / Capacity Analysis

Diagram flow of traffic at access point(s) for site and adjacent development.
Perform capacity analysis for daily and peak hour volumes

8. Traffic Signal Impacts

For modified and proposed traffic signals:
a. Traffic Signal Warrants as identified.
b. Traffic Signal drawings as identified.
c. Queuing Analysis

9. Design and Mitigation.

Determine and document safe and efficient operational design needs based on site and study area data. Identify operational concerns and mitigation measures to ensure safe and efficient operation pursuant to appropriate state highway access category.

Traffic Study Level III

Project ADT 3,000 to10,000 trips or peak hour traffic 500 to 1,200 trips.

1. Study Area

The study area, depending on the size and intensity of the development and surrounding development, may be identified by parcel boundary, area of immediate influence or reasonable travel time boundary.

An acceptable traffic study boundary should be based on travel time or by market area influence. Intersection of site access drives with state highways and any intersection within 1/2 mile of property line on each side of project site.

2. Design Year

Opening day of project, five years and twenty years after opening.
Document and include all phases of development (includes out pad parcels).

3. Analysis period

For each design year analyze site and adjacent road traffic for weekday A.M. and P.M. peak hours including Saturday peak hours if identified as needed per the City Engineer. Identify special event peak hour as necessary (adjacent roadway peak and site peak).

4. Data Collection

a. Daily and Turning movement counts.
b. Identify site and adjacent street roadway and intersection geometries.
c. Traffic control devices including traffic signals and regulatory signs.
d. Automatic continuous traffic counts for at least 48 hours.
e. Traffic accident data.

5. Trip Generation

Use equations or rates available in latest edition of ITE Trip Generation. Where developed equations are unavailable for intended land use, perform trip rate study and estimation following ITE procedures or develop justified trip rate agreed to by the Department.

6. Trip Distributions and Assignment

Document distribution and assignment of existing, site, background, and future traffic volumes on surrounding network of study area.

7. Capacity Analysis

a. Level of Service (LOS) for all intersections.
b. LOS for existing conditions, design year without project, design year with project.

8. Traffic Signal Impacts. For proposed Traffic Signals:

a. Traffic Signal Warrants as identified.
b. Traffic Signal drawings as identified.
c. Queuing Analysis.
d. Traffic Systems Analysis. Includes acceleration, deceleration and weaving.
e. Traffic Coordination Analysis

10. Accident and Traffic Safety Analysis

Existing vs. as proposed development.

11. Design and Mitigation

Determine and document safe and efficient operational design needs based on site and study area data. Identify operational concerns and mitigation measures to ensure safe and efficient operation pursuant to appropriate state highway access category.

Traffic Study Level IV

Project ADT greater than 10,000 trips or peak hour traffic > 1,200 vehicles per hour.

1. Study Area

The study area, depending on the size and intensity of the development, will include the surrounding roadways ½ mile from the parcel boundary or reasonable travel time boundary.

2. Design Year

Opening day of project, five years and twenty years after opening.
Document and include all phases of development (includes out pad parcels).

3. Analysis period

For each design year analyze site and adjacent road traffic for weekday A.M. and P.M. peak hours including Saturday peak hours as needed per the City Engineer. Identify special event peak hour as necessary (adjacent roadway peak and site peak).

4. Data Collection

a. Daily and Turning movement counts.
b. Identify site and adjacent street roadway and intersection geometries.
c. Traffic control devices including traffic signals and regulatory signs.
d. Automatic continuous traffic counts for at least 24 hours or obtain ADT from local or state agencies
e. Traffic accident data.

5. Trip Generation

Use equations or rates available in latest edition of ITE Trip Generation. Where developed equations are unavailable for intended land use, perform trip rate study and estimation following ITE procedures or develop justified trip rate agreed to by the Department.

6. Trip Distributions and Assignment

Document distribution and assignment of existing, site, background, and future traffic volumes on surrounding network of study area.

7. Capacity Analysis

a. Level of Service (LOS) for all intersections.
b. LOS for existing conditions, design year without project, design year with project.

8. Traffic Signal Impacts. For proposed traffic signals:

a. Traffic Signal Warrants as identified.
b. Traffic Signal drawings as identified.
c. Queuing Analysis.
d. Traffic Systems Analysis. Includes acceleration, deceleration and weaving.
e. Traffic Coordination Analysis.

9. Accident and Traffic Safety Analysis. Existing vs. as proposed develop

10. Design and Mitigation

Determine and document safe and efficient operational design needs based on site and study area data. Identify operational concerns and mitigation measures to ensure safe and efficient operation pursuant to appropriate state highway access category.

LAYTON CITY COUNCIL MEETING
AGENDA ITEM COVER SHEET

Item Number: 3.

Subject:
Presentation - Highway 89 Corridor Planning

Background:
N/A

Alternatives:
N/A

Recommendation:
N/A

LAYTON CITY COUNCIL MEETING
AGENDA ITEM COVER SHEET

Item Number: 4.

Subject:
Amend Layton Municipal Code – Title 3 (Revenue & Finance), Section 3.15.10 (Consolidated Fee Schedule of Layton City Corporation); and Title 19 (Zoning), Sections 19.06.010 (Definitions), 19.21.020(8) (General Regulations) and 19.21.045 (Mobile Food Vendor) Establishing Regulations for Mobile Food Vendors – Ordinance 16-06

Background:
Within the last few years mobile food vendors (food trucks and trailers) have become a fast growing segment within the dining industry. This past spring and summer, Staff has seen an increased desire for food trucks to locate within Layton City, as well as businesses requesting food trucks to operate temporarily or long term at their location. The existing City code does not adequately address issues specific to food trucks and trailers, such as, requested flexibility of locations, vendor size, and safety concerns that come with mobile food vending.

This proposed amendment to the zoning ordinance provides regulations and guidelines for mobile food vendors. Staff first presented research to the Planning Commission for mobile food vendors on September 22, 2015, during a work meeting. Staff continued to compile research and on October 13, 2015, during a work meeting the Planning Commission continued their review of the mobile food vendor ordinance and requested Staff make adjustments to the ordinance. On November 10, 2015, the Planning Commission held a public hearing and forwarded a positive recommendation to the Council to approve regulations and guidelines for mobile food vendors.

On December 17, 2015, the Council held a public hearing to review the proposed mobile food vendor ordinance. It was mentioned that mobile food vendors wanting to operate within the City for any period of time would have to obtain a commercial license at the cost of $120 dollars, plus $50 dollars for an annual inspection conducted by the Fire Department. In addition, a mobile food court would be permitted under a single event permit which can only last for seven consecutive days. Some Council Members were concerned the fee structure was too high, especially for vendors that want to operate a food court on a weekly schedule. Since that time, Staff has collected feedback from mobile food vendors and The Food Truck League (a local food truck event organizer) to determine appropriate language for regulating mobile food vendors and fees.

The ordinance amendment includes permitting mobile food courts under a mobile food court permit and allowing mobile food vendors to operate under one of two types of licenses; (1) Mobile Food Vendor License or (2) Mobile Food Event License. Event and individual vendor fees are outlined in the attached amendment to the Consolidated Fee Schedule. An Event License allows vendors to only operate at pre-approved mobile food court locations. Individually licensed vendors are permitted to operate at food court locations, in the public right-of-way on roads with speed limits 35 miles per hour or less and to operate on private property within the B-RP, C-H, CP-1, CP-2, CP-3, M-1, M-2, MU and MU-TOD zoning districts. Additional requirements for mobile food vendors include a 200 foot buffer from restaurants, schools and parks, Fire Department standards, and criminal background check requirements. Included are map examples illustrating permitted areas and buffers.

Alternatives:
Alternatives are to 1) Adopt Ordinance 16-06 approving the amendments to the Layton Municipal Code Title 3 (Revenue & Finance), Section 3.15.10 (Consolidated Fee Schedule of Layton City Corporation); and Title 19 (Zoning), Sections 19.06.010 (Definitions), 19.21.020(8) (General Regulations) and 19.21.045 (Mobile Food Vendor) establishing regulations for mobile food vendors; 2) Adopt Ordinance 16-06 with modifications or additions; or 3) Not adopt Ordinance 16-06.

Recommendation:
On November 10, 2015, the Planning Commission unanimously recommended the Council adopt Ordinance 16-06 approving the amendments to Title 19 (Zoning), Sections 19.06.010 (Definitions), 19.21.020(8) (General Regulations) and 19.21.045 (Mobile Food Vendor) of the Layton Municipal Code establishing regulations for mobile food vendors.

Staff supports the recommendation of the Planning Commission in regards to amending Sections 19.06.010, 19.21.010, 19.21.020 and 19.21.045 of the Layton Municipal Code. Staff also supports amending Title 3 (Revenue & Finance), Section 3.15.10 (Consolidated Fee Schedule of Layton City Corporation) as outlined in the attached amendment.

LAYTON CITY COUNCIL MEETING
AGENDA ITEM COVER SHEET

Item Number: 5.

Subject:
Mayor's Report

Background:
N/A

Alternatives:
N/A

Recommendation:
N/A